# ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF THE ESKOM KARUSA SWITCHING STATION, 132KV DOUBLE CIRCUIT OVERHEAD POWER LINE AND ANCILLARIES NEAR SUTHERLAND, NORTHERN CAPE

## DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

**Submitted as part of the Basic Assessment Report**

**October 2015**

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## *PROJECT DETAILS*

| | | |
|---|---|---|
| **Title** | : | Environmental Management Programme for the proposed construction of the Eskom Karusa Switching Station, 132kV double circuit overhead power line and ancillaries near Sutherland, Northern Cape. |
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# *DEFINITIONS AND TERMINOLOGY*

**Alien species:** A species that is not indigenous to the area or out of its natural distribution range.

**Alternatives:** Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

**Ambient sound level**: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

**Assessment:** The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

**Biological diversity:** The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

**Commence:** The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

**Cumulative impacts:** Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

**Direct impacts:** Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

**Disturbing noise**: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

**Ecosystem:** A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

**Endangered species:** Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

**Endemic:** An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

**Environment:** the surroundings within which humans exist and that are made up of:

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

**Environmental Impact:** An action or series of actions that have an effect on the environment.

**Environmental impact assessment:** Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

**Environmental management:** Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

**Environmental Management Programme:** A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

**Environmental assessment practitioner:** An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

**Habitat:** The place in which a species or ecological community occurs naturally.

**Hazardous waste:** Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

**Indigenous:** All biological organisms that occurred naturally within the study area prior to 1800

**Indirect impacts:** Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

**Interested and Affected Party:** Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

**Pollution:** A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

**Rare species:** Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

**Red data species:** Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

**Significant impact:** An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Waste:** (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (as amended) (NEM:WA); or (b) any other substance, material or object that is not included in schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste— (i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered; (ii) where approval is not required, once a waste is, or has been re used, recycled or recovered; iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

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**APPENDICES:**

# *PROJECT DETAILS* *CHAPTER 1*

It is ACED Renewable Hidden Valley's (Karusa Wind Farm) (the "Proponent") intention to develop the authorised Karusa Wind Energy Facility (Department of Environmental Affairs' Ref: 12/12/20/2370/1), a Preferred Bidder project in terms of the Department of Energy's Renewable Energy Independent Power Producer Procurement Process (REIPPPP) Bid Window (Round) Four. In order to connect and evacuate the power from the Karusa Wind Energy Facility into the National Eskom grid, the following infrastructure (the "Project") will be required:

- Construction of the Eskom Karusa Switching Station (approximately 120m x 120m);
- Construction of a 132kV double circuit overhead power line; and
- Ancillaries (including access tracks/roads, laydown areas, system metering installation, operational and management facilities).

A 300m wide corridor was investigated for the Project (refer to Map 1 of Appendix 6) to allow for optimisation of the infrastructure layout in order to, inter alia, accommodate specialist findings where necessary. The power overhead line will have associated access tracks (approximately 4m in width) where these are required. This infrastructure will fall within this assessed corridor, the final placement of which will depend on local geotechnical, topographical conditions and potential environmental sensitivities.

**Site Location**

The following properties will be affected by the construction of the proposed overhead power line, switching station and ancillaries (refer to Table 1.1):

- Remainder of the Farm De Hoop 202;
- Remainder of the Farm Rheebokke Fontein 209
- Portion 3 of the Farm Rheebokke Fontein 209;
- Remainder of the Farm Standvastigheid 210; and
- Farm Standvastigheid 210.

**Table 1.1:** Location of the study area

| **Province** | **Northern Cape Province** |
|---|---|
| District Municipality | Namakwa District Municipality |
| Local Municipality | Karoo Hoogland Local Municipality |
| Ward number(s) | Ward 4 - Karoo Hoogland Local Municipality |
| Nearest town(s) | ~20km north of Matjiesfontein and ~50 km south of Sutherland |
| Farm name(s) and number(s) | Remainder of the Farm De Hoop 202;<br>Remainder of the Farm Rheebokke Fontein 209; |

| **Province** | **Northern Cape Province** |
|---|---|
| | Portion 3 of the Farm Rheebokke Fontein 209;<br>Remainder of the Farm Standvastigheid 210; and<br>Farm Standvastigheid 210 |
| SG 21 Digit Code | C07200000000020200000<br>C07200000000020900000<br>C07200000000020900003<br>C07200000000021000000<br>C07200000000021000002 |

This Environmental Management Programme (EMPr) has been prepared as part of the Basic Assessment process for the proposed Project near Sutherland, Northern Cape.

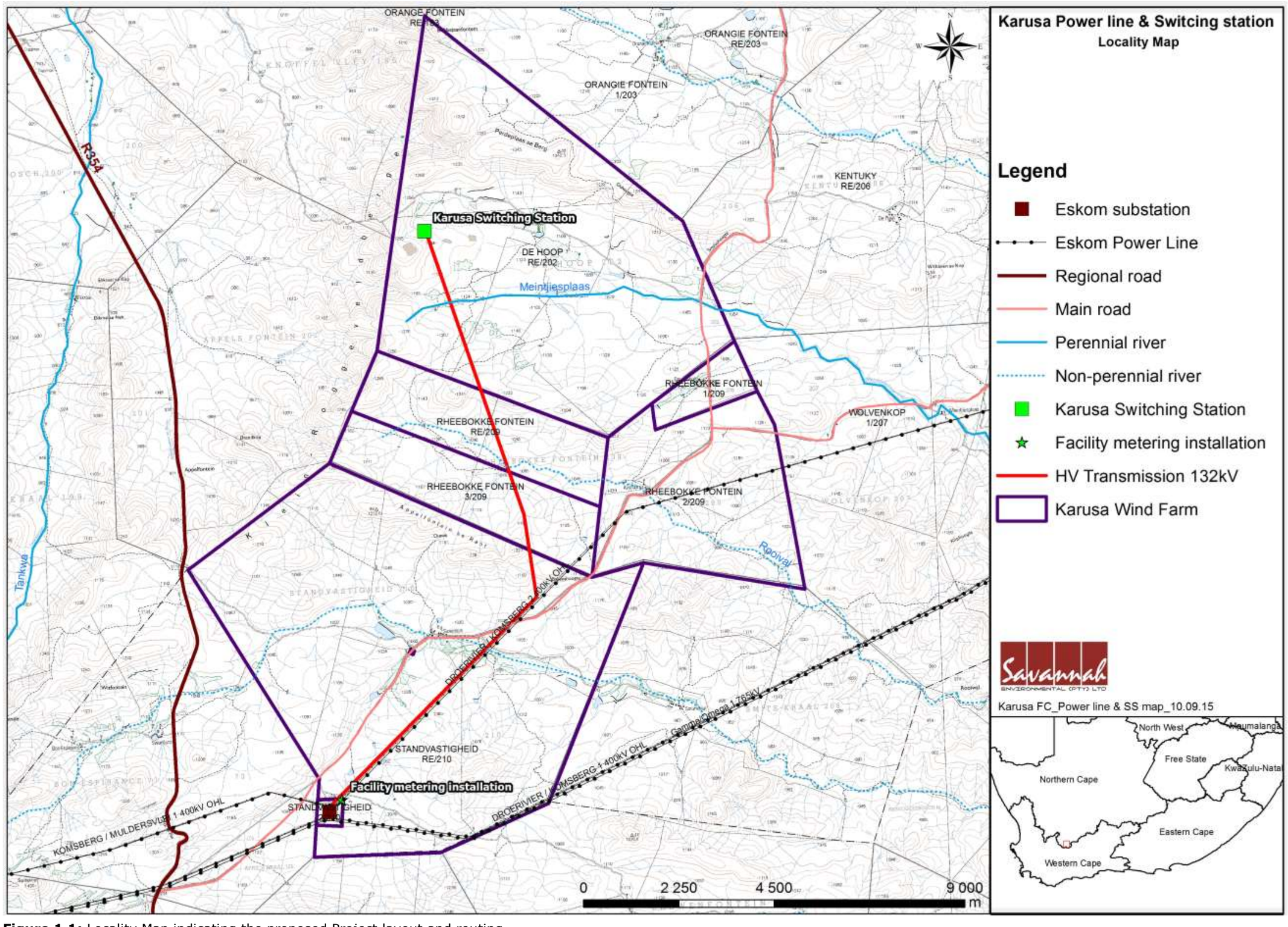


**Figure 1.1:** Locality Map indicating the proposed Project layout and routing

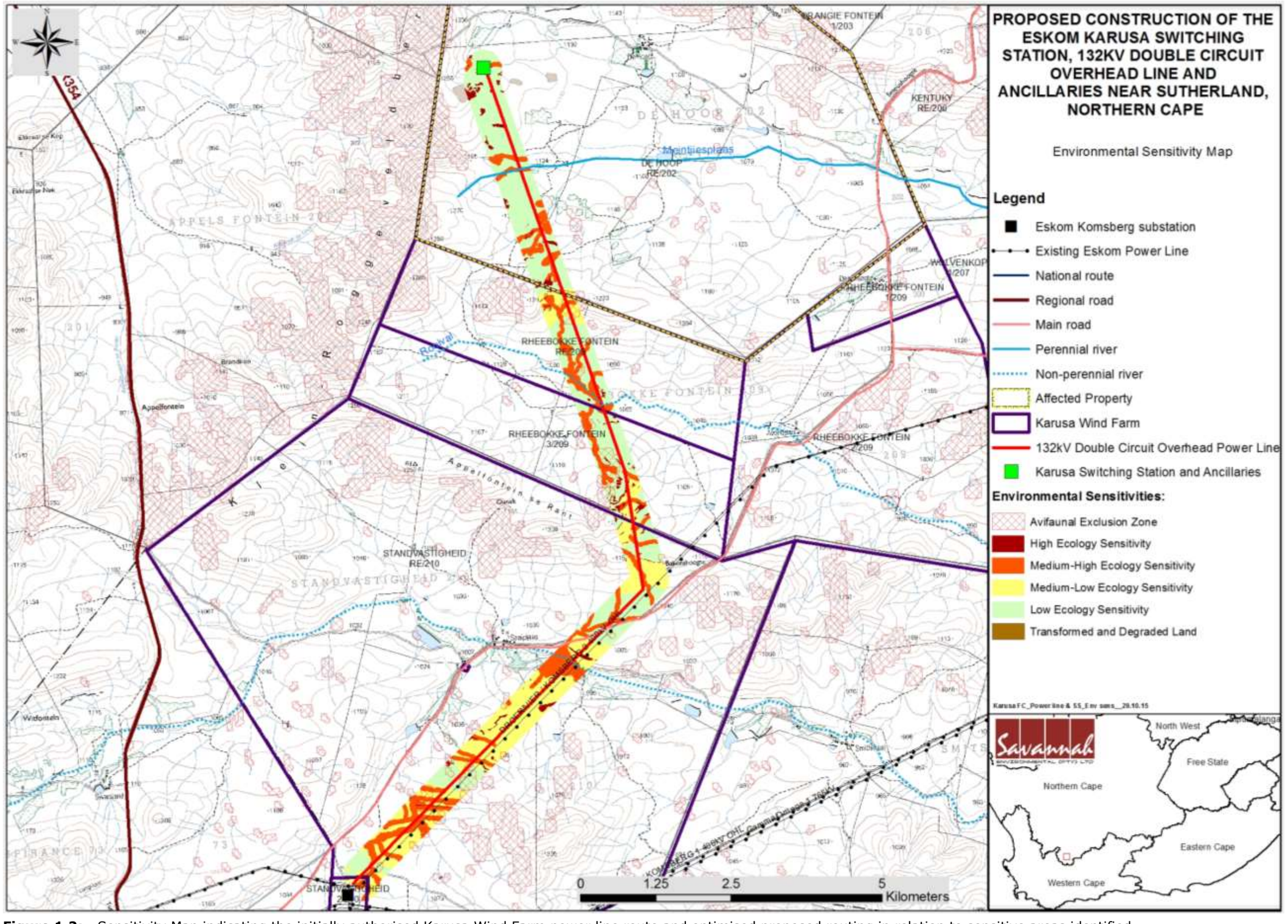


**Figure 1.2:** Sensitivity Map indicating the initially authorised Karusa Wind Farm power line route and optimised proposed routing in relation to sensitive areas identified

## 1.1. Potential impacts

Through the assessment of impacts associated with the proposed construction of the Project which will connect the facility to the Komsberg MTS, undertaken as part the Basic Assessment (BA) process, both potentially positive and negative impacts have been identified.

The primary project components, for which mitigation and management measures are specified, include the following:

- Construction of the Eskom Karusa Switching Station (approximately 120m x 120m); Construction of a 132kV double circuit overhead power line; and
- Ancillaries (including access tracks/roads, laydown areas, system metering installation, operational and management facilities).

The most significant environmental impacts associated with the proposed Project include:
**Ecology**: Overall, the ecological impacts of the development will be **low negative** after mitigation measures, mainly due to a loss of small areas of vegetation, and habitat loss for fauna. Positive impacts include the active management of the alien vegetation and erosion management on the site. Impacts associated with the proposed Project are unlikely to result in any fatal flaws. From an ecological perspective, the proposed construction of the Project **is considered acceptable for all alternatives**.

**Avifauna**: The avifaunal habitats in the project site are not particularly unique, and the majority of the Project falls outside of sensitive avifaunal areas, while also following existing infrastructure where possible. An assessment of the level of impact identified potential impacts ranging from high to low significance, which can be reduced to low with the application of recommended mitigation measures. The residual impacts have been found to be acceptable. The proposed corridor and the preferred options for the proposed Project **are considered acceptable from an avifaunal perspective for all alternatives**.

**Heritage:** The –proposed Project is considered to have an impact of **low significance** on archaeology and heritage. The proposed corridor and the preferred options for the proposed Project **are considered acceptable from an heritage perspective for all alternatives**.

**Social Impact:** Social impacts are expected during all phases of the development and are expected to be both positive and negative. Negative and positive impacts are expected to be of **low significance** for the various issues. Impacts can be minimised or enhanced through the implementation of the

recommended management measures. From a social perspective, the proposed construction of the Project is **considered acceptable for all alternatives**.

**Visual Impacts:** The proposed Project as assessed in this Basic Assessment Report is not likely to contribute significantly to the potential visual impacts associated with the existing much taller wind turbine structures of the authorised Karusa Wind Farm, the existing power lines in the area and the Komsberg MTS in the study area. Therefore the potential visual impacts associated with the proposed Project are expected to have a **low significance** and should not alter/influence the outcome of the Project decision-making. From a visual perspective, the proposed Project is **considered to be acceptable for all alternatives**.

**Cumulative Impacts:** Cumulative impacts from the proposed Project will result from impacts arising from multiple power lines being constructed in the area (from other project phases). As this infrastructure is located within the authorised Karusa Wind Farm boundary, the contribution of this infrastructure to the cumulative impacts in the area is considered to be **low and acceptable**.

**Overall conclusion**

From the specialist studies undertaken, the proposed Project is considered to be acceptable from an environmental perspective. The proposed Project locations are also considered technically and financially feasible based on detailed design and discussions with Eskom. No siting alternatives have been assessed for the proposed Project due to the location of this infrastructure within the boundaries of the authorised wind energy facility and based on the fact that the approved connections, which were considered in the EIA study for the authorised Karusa Wind Farm and other project phases, are no longer technically feasible as connection options for the optimised Karusa Wind Energy Facility – for reasons explained in this BAR.

Based on the findings of the studies undertaken, in terms of environmental constraints and opportunities identified through the Environmental Basic Assessment process, no environmental fatal flaws were identified to be associated with the construction of the proposed Project. Impacts are expected to be of **low** significance after the implementation of appropriate mitigation and it is recommended that the proposed development can therefore be implemented. With reference to the information available at this planning approval stage in the project cycle, the confidence in the environmental assessment undertaken is regarded as acceptable.

The sensitivity map (Figure 1.2) is the result of a composite overlay based on the findings of the BA studies undertaken for the proposed Project. The proposed Project was concluded to be acceptable from an environmental perspective within

the context of the receiving environment as it avoids any potentially sensitive areas.

## 1.2. Activities and Components associated with the Development

### *1.2.1. Construction Phase*

**Construction of the 132kV Double Circuit Overhead Power Line:**

The 132kV double circuit overhead power line will be approximately 16km in length and would be located within the assessed 300m wide corridor. Overhead power lines are constructed in the following simplified sequence:

Step 1: Surveying of the development area and negotiation with affected landowners;
Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities;
Step 3: Vegetation clearance and construction of access roads/tracks (where required);
Step 4: Construction of foundations;
Step 5: Assembly and erection of infrastructure on site;
Step 6: Stringing of conductors;
Step 7: Rehabilitation of disturbed areas and protection of erosion sensitive areas; and
Step 8: Continued maintenance.

Construction of the proposed power line will take approximately 6 to 9 months to complete. The duration of the construction period will however depend on the season and climatic conditions on site, e.g. strong winds might affect stringing of conductors which could result in delays.

Power line towers (or pylons) are an average distance of 200m apart but can exceed 500m depending on the topography and terrain to be spanned. Construction of minor access roads to the tower positions and construction of tower foundations will be the most significant construction phase activity resulting in environmental impact requiring mitigation. The footprint of each tower foundation will be a approximately 10mx10m (100m²) depending on the final structure to be used. The actual size and type of foundation will be determined by the underlying geotechnical conditions and the type of structure to be used for the towers/pylons. The tower types are likely to be steel monopoles generally in vertically staggered configuration except where potential existing lines would need to be crossed under in which case horizontal configuration would be used in order to maintain safety clearances. The afore-mentioned will need to be confirmed during detailed design as it will be informed by the local geotechnical and topographical conditions which could require the use of self-supporting steel towers.

The minimum vertical clearance to buildings, poles and structures not forming part of the power line must be 3,8m, while the minimum vertical clearance between the conductors and the ground is 6,3m. The minimum distance between trees or shrubs and any bare phase conductor of a 132 kV power line must be 3,8m, allowing for the possible sideways movement and swing of both the power line conductor and the tree or shrub. The minimum clearance to other overhead line conductors, if and where applicable, will be 2m. The final definition of the centre line for the power line and co-ordinates of each bend in the line (if applicable) will be determined on receipt of an environmental approval of the assessed corridor by the environmental Authorities and after negotiations with landowners and final environmental and technical surveys. Optimal tower sizes and positions will be identified and verified using a ground survey (in terms of the Environmental Management Programme (EMPr)) requirements.

**Construction of the Eskom Karusa Switching Station:**

A switching station will be required to connect the power that would be generated by the Karusa Wind Farm into the National Eskom grid. Switching stations (approximately 120m x 120m) are constructed in the following simplified sequence:

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

The construction of the ancillary infrastructure will follow a similar sequence as that of the switching station described above.

### *1.2.2. Operation Phase*

The proposed Project will require routine maintenance work throughout the operation period, which would be the same as that of the Power Purchase Agreement (PPA) of the Karusa Wind Farm, i.e. at least 20 years. During operation, the Project will be accessed via a gravel provincial road, from other existing gravel roads in the area and any access roads/tracks established during

the construction phase. During this operation phase vegetation within the power line servitude, and around the switching station will require management only if it impacts on the safety and operational objectives of the Project. The maintenance of the grid connection infrastructure will be the responsibility of the Proponent.

### *1.2.3. Decommissioning Phase*

The Project is expected to have a lifespan of more than 25 years (with maintenance) and the infrastructure would only be decommissioned once it has reached the end of its economic life or is no longer required. The PPA of the Karusa Wind Farm, in terms of the REIPPPP is 20 years, and therefore the proposed Project may not be required after 20 years if the Karusa Wind Farm is decommissioned. If the Karusa Wind Farm is decommissioned and the proposed Project is no longer needed, the decommissioning activities would comprise of; the disassembly of the individual components and removal from site. This phase would then include the following activities:

**a. Site Preparation**

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

**b. Disassemble Components**

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

**c. Rehabilitation**

Disturbed areas (where infrastructure has been removed) will be rehabilitated, if required, depending on the future land-use of the site and the relevant legislation applicable at the time of decommissioning.

# PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 2

An EMPr is a set of guidelines and actions aimed at ensuring that construction and/or installation activities, and subsequent management of facilities, are undertaken in a manner that minimises environmental risks and impacts. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operational phases of a project.

The EMPr provides specific environmental guidance for the construction, operational and decommissioning phases of a project, and is intended to manage and mitigate construction and operational activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This EMPr has been compiled in accordance with Appendix 4, Section 1 of the EIA Regulations of December 2014 (refer to Table 3.1) and will be further developed in terms of specific requirements listed in any authorisations or permit issued for the proposed project. The EMPr has been developed as a set of environmental specifications which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of expected impacts of activities and various monitoring and implementation tools for the management measures).

This EMPr has the following objectives:

» Outline impact management objectives and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the Project in order to manage and minimise the extent of potential environmental impacts associated with the Project.

» Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential positive environmental benefits are enhanced.
» Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
» Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
» Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the BA process.

The management and mitigation measures identified within the BA process are systematically addressed in this EMPr, and ensure the minimisation of identified adverse environmental impacts to an acceptable level. This EMPr has been prepared as part of the environmental authorisation process for the proposed grid connection infrastructure.

The Proponent must ensure that the implementation of the Project complies with the requirements of all its Environmental Authorisations, permits, and obligations emanating from relevant environmental legislation.

This EMPr shall be binding on all the relevant parties and as contained in this EMPr, involved in the construction, operational and decommissioning phases of the project, and shall be enforceable at all levels of contract and operational management within the project.

# STRUCTURE OF THIS EMPR CHAPTER 3

The first two chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Key legislation applicable to the development;
» Pre-construction, planning and design activities;
» Construction activities;
» Rehabilitation activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for the construction, operation and decommissioning of the proposed with proposed power line, facility switching station and facility metering installation in order to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr has been structured in a table format in order to show the links between the goals for each phase and their associated impact management objectives, activities/risk sources, mitigation actions and management statements, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental impact management objective. The information provided within the EMPr table for each objective is outlined below.

***a). OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the BA specialist studies***

| | |
|---|---|
| **Project Component/s** | » List of project components affecting the objective. |
| **Potential Impact** | » Description of the potential environmental impact if objective is not met. |
| **Activity/Risk Source** | » Description of activities which could affect achieving the objective. |
| **Mitigation: Target/Objective** | » Description of the target and/or desired outcomes of mitigation. |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Lists specific action(s) required to meet the mitigation target/objective described above. | Who is responsible for the measures? | Periods for implementation. |

| | |
|---|---|
| **Performance Indicator** | Description of key indicator(s) that track progress/indicate the effectiveness of the EMP. |
| **Monitoring** | Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting. |

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change;
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; or
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

## 3.1. Content of the EMPr: Legislated and DEA Requirements

**Table 3.1:** Content of this EMPr in terms of NEMA and Appendix 4 of the EIA Regulations of December 2014

| Requirement | EMP Reference |
|---|---|
| **EMP REQUIREMENTS IN TERMS OF APPENDIX 4 OF EIA REGULATIONS** | |
| (a) details of—<br>(i) the EAP who prepared the EMPr; and<br>(ii) the expertise of the EAP to prepare an EMPr | Section 3.2 |
| (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description; | Section 1.3 |
| (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—<br>(i) planning and design;<br>(ii) pre-construction activities;<br>(iii) construction activities;<br>(iii) where relevant operation activities; and<br>(iv) rehabilitation of the environment after construction and where applicable post closure; | Chapter 5 – Preconstruction and planning<br><br>Chapter 6 – Construction activities<br><br>Chapter 7 – Rehabilitation<br><br>Chapter 8 – Operation |

| Requirement | EMP Reference |
|---|---|
| | activities |
| (d) a description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph (c); | Chapters 6-8 |
| (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 —<br>(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>(ii) remedy the cause of pollution or degradation and migration of pollutants;<br>(iii) comply with any prescribed environmental management standards or practices;<br>(iv) comply with any applicable provisions of the Act regarding closure, where applicable;<br>(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable | Actions listed in terms of each Objective detailed in Chapters 6-8 |
| (f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (e); | Monitoring requirements listed under each Objective detailed in Chapters 6-8 |
| (g) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (e); | Monitoring requirements and timeframes listed under each Objective detailed in Chapters 6-8 |
| (h) an indication of the persons who will be responsible for the implementation of the impact management actions; | Responsibility listed for each management action under each Objective detailed in Chapters 6-8 |
| (i) the time periods within which the impact management actions contemplated in paragraph (e) must be implemented; | Timeframes listed for each management action under each Objective detailed in Chapters 6-8 |
| (j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (e); | Monitoring requirements listed under each Objective detailed in Chapters 6-8 |
| (k) a program for reporting on compliance, taking into account the requirements as prescribed by these Regulations; and | Section 6.5 |
| (l) an environmental awareness plan describing the manner in which—<br>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their | Section 6.4 |

| Requirement | EMP Reference |
|---|---|
| work; and<br>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment. | |

## 3.2. Project Team

This draft EMPr was compiled by and had input from:

| | Name | Company |
|---|---|---|
| EMPr Compilers: | Tebogo Mapinga<br>Jo-Anne Thomas | Savannah Environmental |
| Ecological impact assessment | Gerhard Botha | Savannah Environmental |
| Avifaunal impact assessment | Andrew Pearson | Arcus Consulting Services |
| Heritage impact assessment | Celeste Booth | Booth Heritage Consulting |

The Savannah Environmental team has extensive knowledge and experience in EIAs and environmental management, having been involved in BA processes & EIAs over the past fifteen years. The team has managed and drafted EMPRs for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

## 3.3. Details of the EAP

Environmental Assessment Practitioners (EAPs) and Public Participation consultants from Savannah Environmental who are responsible for this project are:

» *Tebogo Mapinga* - is a Senior Environmental Consultant, holds a BSc degree with 8 years of experience in the environmental field in both public and private sectors. Her competencies lie in environmental impact assessments, compliance monitoring and public participation for small and large scale projects.
» *Jo-Anne Thomas* - a registered Professional Natural Scientist and holds a Master of Science degree. She has 17 years' experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently involved in undertaking siting

processes as well as EIAs for several renewable energy projects across the country.

» *Gabriele Wood* - holds a Honours Degree in Anthropology, obtained from the University of Johannesburg. She has 6 years consulting experience in public participation and social research. Her experience includes the design and implementation of public participation programmes and stakeholder management strategies for numerous integrated development planning and infrastructure projects. Her work focuses on managing the public participation component of Environmental Impact Assessments and Basic Assessments undertaken by Savannah Environmental.

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

# APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES CHAPTER 4

The following legislation and guidelines have informed the scope and content of this EMPr Report:

» National Environmental Management Act (Act No 107 of 1998).
» EIA Regulations, published under Chapter 5 of the NEMA (GNR R983, GNR 984 in Government Gazette 38282 of 4 December 2014).
» Guidelines published in terms of the NEMA EIA Regulations, in particular:

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the BAR. A review of legislative requirements applicable to the proposed project is provided in Table 4.1.

**Table 4.1:** Relevant legislative and permitting requirements applicable to the proposed grid connection infrastructure

| Legislation | Applicable Requirements | Relevant Authority | Compliance requirements |
|---|---|---|---|
| ***National Legislation*** | | | |
| National Environmental Management Act (Act No. 107 of 1998) | The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.<br><br>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.<br><br>In terms of GNR 983 and 985 of June 2010 a Basic Assessment Process is required to be undertaken for the proposed project. | » National Department of Environmental Affairs (DEA)<br>» Northern Cape Department of Environment and Nature Conservation (NC DENC) – commenting authority | The listed activities triggered by the proposed Project has been identified and assessed in the EIA process being undertaken (i.e. Basic Assessment).<br><br>This Basic Assessment Report will be submitted to the competent and commenting authority in support of the application for authorisation. |
| National Environmental Management Act (Act No. 107 of 1998) | In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised. | DEA | While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed Project has found application in the EIA process.<br><br>The implementation of mitigation measures are included as part of |

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| | | | the Draft EMPr and will continue to apply throughout the life cycle of the Project. |
| National Environmental Management: Biodiversity Act (Act No. 10 of 2004) | In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007.<br><br>In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase.<br><br>» The Act provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, | » DEA<br>» NC DENC | As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard.<br><br>A Specialist Ecological Assessment was undertaken as part of the Basic Assessment process (refer to Appendix D). As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species, as well as critically endangered (CR), endangered (EN), vulnerable (VU) or protected ecosystems and species and the potential for them to be affected has been considered. No such species were identified to be affected by the proposed project. |

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| | together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (GG 34809, GN 1002), 9 December 2011). | | |
| National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) | The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.<br><br>The Minister may amend the list by –<br><br>» Adding other waste management activities to the list.<br>» Removing waste management activities from the list.<br>» Making other changes to the particulars on the list.<br><br>In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities (Category A | » DEA<br>» NC DENC | As no waste disposal site is to be associated with the proposed Project, no permit is required in this regard.<br><br>Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPr (refer to Appendix G). |

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| | and B) while Category C Activities (such as storage of waste) must be undertaken in accordance with the necessary norms and standards.<br><br>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:<br><br>» The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste.<br>» Adequate measures are taken to prevent accidental spillage or leaking.<br>» The waste cannot be blown away.<br>» Nuisances such as odour, visual impacts and breeding of vectors do not arise; and<br>» Pollution of the environment and harm to health are prevented. | | |
| National Environmental Management: Air Quality Act (Act No. 39 of 2004) | S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas."<br><br>Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.<br><br>» GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all | » DEA<br>» Karoo Hoogland Local Municipality | Dust Control Regulations describe the measures for control and monitoring of dust, including penalties. These regulations might be applicable during the construction phase of the project. Dust management have also been accounted for in the EMPr (see Appendix G) |

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| | areas | | |
| National Water Act (Act No. 36 of 1998) | Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.<br><br>In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring. | » National Department of Water and Sanitation<br>» Northern Cape Department of Water and Sanitation | A water use license (WUL) or General Authorisation might be required in terms of Section 21 of the Act due to the drainage lines which could be impacted by the proposed Project, in particular the associated access road(s). |
| Environment Conservation Act (Act No. 73 of 1989) | » National Noise Control Regulations (GN R154 dated 10 January 1992) | » DEA<br>» NC DENC | Noise impacts are expected to be associated with the construction phase of the Project and are not likely to present a significant intrusion to the local community. There is no requirement for a noise permit in terms of the legislation. |
| Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) | » A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.<br>» Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.<br>» S18, S19, and S20 of the Act allow certain areas to be declared and | » Department of Mineral Resources | As no borrow pits are expected to be required for project, no mining permit or right is required to be obtained. |

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| | managed as "priority areas."<br>» Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.<br>» GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all areas | | |
| National Heritage Resources Act (Act No. 25 of 1999) | » S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including<br>» The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length;<br>» Any development or other activity which will change the character of a site exceeding 5 000 $m^2$ in extent<br>» The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 $m^2$; or the re-zoning of a site exceeding 10 000 $m^2$ in extent. This notification must be provided in the early stages of initiating that development, and | » South African Heritage Resources Agency<br>» Northern Cape Heritage Resources Authority | A permit may be required should any identified cultural/ heritage sites on site be required to be disturbed or destroyed as a result of the proposed development.<br>One stone artefact was documented on the Farm Standvastigheid 210 along the proposed power line route toward the Komsberg Substation. Two dry packed stone wall features intersect the same power line route on the Farm Standvastigheid 210. Considering that the proposed power line is overhead, it should not affect the stone wall features negatively as long as pylons are micro-sited to avoid these features (as per the recommendations in Heritage report (refer to **Appendix D**). |

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| | details regarding the location, nature and extent of the proposed development must be provided.<br>» Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component. | | |
| National Forests Act (Act No. 84 of 1998) | » In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated".<br>» The list of protected tree species was published in GN 877 of 22 November 2013. | » Department of Agriculture, Forestry and Fisheries<br>» NC DENC | No protected trees were identified within the study area and therefore no permits would be required in this regard. |
| National Veld and Forest Fire Act (Act 101 of 1998) | » In terms of S12 the landowner would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land.<br>» In terms of S12 the firebreak would need to be wide and long enough to | Department of Agriculture, Forestry and Fisheries | While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project. |

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| | have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.<br>» In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires. | | |
| Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983) | » Prohibition of the spreading of weeds (S5).<br>» Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur.<br>» Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048). | Department of Agriculture, Forestry and Fisheries | An Ecology study was undertaken (refer to **Appendix D**) and CARA was taken into account. The relevant mitigations measures were identified and are included in the EMPr (**Appendix G**). |
| Hazardous Substances Act (Act No. 15 of 1973) | This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. | » Department of Health | It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license could be required to be obtained from the Department of Health. |

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| | » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance;<br>» Group IV: any electronic product;<br>» Group V: any radioactive material.<br><br>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force. | | |
| National Road Traffic Act (Act No 93 of 1996) | The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.<br><br>Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and | » Provincial Department of Transport (provincial roads)<br>» South African National Roads Agency Limited (national roads) | An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits could be required for vehicles carrying abnormally heavy or abnormally dimensioned loads.<br><br>Depending on the trailer configuration and height when loaded, some of the components may not meet specified dimensional limitations (height and width) and would need to apply for the relevant permit/ |

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| | culverts.<br><br>» The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations. | | clearance. |
| **Provincial Legislation** | | | |
| Northern Cape Nature Conservation Act (Act No. 9 of 2009) | » Provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.<br>**Manipulation of boundary fences**<br>19. No Person may –<br>(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such | » NC DENC | A permit is required for any activities which involve species listed under schedule 1 or 2. The NC DENC permit office provides an integrated permit which can be used for all provincial and Threatened or Protected Species (TOPS)-related permit requirements.<br><br>Provincially protected plant species were found within the study area. Therefore, a permit could be required for removal of such species. A permit could be required NC DENC to relocate |

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| | person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;<br><br>The Act also lists protected fauna and flora under 3 schedules ranging from Specially protected (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. | | protected plants and to clear natural vegetation mainly along the transmission line grid where poles would be planted. |

# MANAGEMENT PROGRAMME: PRE-CONSTRUCTION CHAPTER 5

**Overall Goal:** undertake the pre-construction (planning and design) activities in a way that:

» Ensures that the design responds to the identified environmental constraints and opportunities.
» Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
» Ensures that the best environmental options are selected for the linear components.
» Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

## 5.1 Objectives

***OBJECTIVE 1: Ensure the design responds to identified environmental constraints and opportunities***

The major impact associated with the construction activities is likely to result from vegetation clearing that will be required.

A sensitivity map has been prepared from the findings of the BA studies undertaken (refer to Figure 1.2).

Lowlands / Bottomlands
Due to the relatively high diversity of species especially species which are protected by provincial legislation, the southern section of this habitat (succulent karoo section) is regarded as being of medium sensitivity. All rocky ridges and gravel plains are regarded as medium-high sensitive areas due to the high occurrence of geophytes and succulents which are protected by provincial legislation. These areas can however be sufficiently avoided through micro-siting within the assessed 300m corridor.

Shrubby Succulent Rocky Patches
Although patchy in distribution and collectively covering a small area of the proposed footprint area these habitats contribute greatly to habitat richness and

species richness. The high abundance of geophytes and succulents found in these areas, of which a high percentage is only restricted to these patches, make these patches worthy of conservation. Thus these patches have been awarded high sensitivity status. No pylons or access roads o relating to proposed development may be allowed within these patches. These areas can however be sufficiently avoided through micro-siting within the assessed 300m corridor. Conductors might potentially span some of these area, but pylons and roads would be able to avoid them.

Drainage Lines

Some level of erosion has been noted along most of these drainage channels and streams although the extent can be regarded as moderate. Some drainage channels and streams within the lower lying areas of the southern half of the proposed development flow through sandy areas with relative dispersive soils. Within these areas the effects of erosion is a bit more advance, although still regarded as moderate. Any removal of vegetation or other types of soil disturbance my render the area susceptible to more exaggerated levels of erosion. Due to the vulnerability of these areas to erosion and degradation due to associated construction activities these drainage lines and streams are regarded as medium-high sensitive areas. All streams and drainage lines within the study area have been delineated by Dr. B. Colloty (Aquatic Impact Statement: Hidden Valley Wind Farms, Northern Cape Province, 2014) for the proposed Wind Farm development. Within his study he proposed a 32 m buffer around all smaller upland streams corresponding to mountain streams and upper foothills. These buffers should also be applied to this proposed development and pylons may not be placed within these 32 m buffer areas.

No species of conservation concern, in terms of the Threatened Species Program, were observed during the site investigation. Some species that are Protected according to Schedule 2 of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) were noted.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries |
| **Potential Impact** | » Soil erosion<br>» Impacts on flora and fauna<br>» Loss of protected plant species<br>» Impacts on sensitive habitats |
| **Activities/Risk Sources** | » Construction not being confined as far as possible to area of impact |

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| **Mitigation: Target/Objective** | » The design responds to the identified environmental constraints and opportunities |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Plan and conduct pre-construction activities in an environmentally acceptable manner | Proponent | Pre-construction |
| Obtain any additional environmental permits required (biodiversity permits, etc.) based on final positioning of infrastructure | Proponent | Project planning |
| A rehabilitation plan that specifies the rehabilitation process should be compiled | Proponent and/or Contractor | Pre-construction |
| Any new access roads are required to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil. Construction vehicles also need to consider the load carrying capacity of road surfaces and adhere to all other prescriptive regulations regarding the use of public roads by construction vehicles. | Engineer/ Contractor | Planning/Design Phase |
| Compile an appropriate storm water management plan. | Contractor | Pre-construction |
| The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractor/sub-contractor contracts. | Proponent and Contractor | Tender process |
| Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and Small, Medium and Micro Enterprises (SMMEs) from the local sector | Proponent / Contractor and subcontractors | Planning/ Pre-construction |

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| **Performance Indicator** | » The design meets the objectives and does not degrade the environment to unsatisfactory levels<br>» Design and layouts respond to the mitigation measures and recommendations in the BAR |
| **Monitoring** | » The Contractor must familiarise himself/herself with the design prior to the commencement of construction<br>» The Environmental Control Officer (ECO) and the Environmental Officer (EO) must familiarise himself/herself with the alignment of the servitude prior to the commencement of construction |

***OBJECTIVE 2: To ensure effective communication mechanisms***

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the Project. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

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| **Project component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Impacts on affected and surrounding landowners and land uses |
| **Activity/risk source** | » Activities associated with the construction of the power line, switching station and facility metering installation<br>» Activities associated with the operation of the power line, switching station and facility metering installation |
| **Mitigation: Target/Objective** | » Effective communication with affected and surrounding landowners<br>» Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| Implement a grievance mechanism procedure for the public (Appendix A) | Proponent/ Contractor | Pre-construction (construction procedure)<br>Pre-operation (operation procedure) |
| Develop and implement a grievance mechanism for the construction, operational and decommissioning phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law. | Contractor | Pre-construction (construction procedure)<br>Pre-operation (operation procedure) |

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| **Performance Indicator** | » Effective communication procedures in place |
| **Monitoring** | » An incident reporting system should be used to record non-conformances to the EMPr |

# MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

**Overall Goal:** Undertake the construction phase in a way that:

» Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
» Minimises impacts on fauna in the study area.
» Minimises the impact on heritage sites should they be uncovered.
» Establishes an environmental baseline during construction activities on the site, where possible.

## 6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

The Proponent must ensure that the project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. The Proponent will retain various key roles and responsibilities during the construction phase.

***OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr***

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Environmental Officer (EO)/ Environmental Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Roles and responsibilities should be confirmed and updated throughout the construction phase in order to ensure effective environmental management and communication between parties.

**Project Manager/Coordinator** is responsible for overall management of project and EMPr implementation. The following tasks will fall within his/her responsibilities:

» Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures.
» Commission internal audits of the construction site against the EMPr
» Confine the construction site to the demarcated agrees
» Ensure that transgressions are rectified through the implementation of corrective action contained in this EMPr.

**Site Manager** (Proponent's on-site Representative) will:

» Be fully knowledgeable with the contents of the BA and risk management.
» Monitor site activities on a daily basis for compliance.
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents of this EMPr.
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
» Have overall responsibility of the EMPr and its implementation.
» Conduct internal audits to ensure compliance to the EMPr.
» Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
» Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
» Confine activities to the demarcated construction site.

An independent **ECO** must be appointed by the Proponent prior to the commencement of any authorised activities. The ECO will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

» Be fully knowledgeable with the contents of the BA.
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation.
» Be fully knowledgeable with the contents of the EMPr.
» Be fully knowledgeable of all the licences and permits issued to the site.
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with them.

» Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing, if reasonable).
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
» Ensure that activities on site comply with all relevant environmental legislation.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the EO/ Environmental Representative.
» Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Submit independent reports to the DEA and other regulating authorities (if specifically required) regarding compliance with the requirements of the EMPr, EA and other environmental permits.

**Contractor** is responsible for the overall execution of the activities envisioned in the construction phase including the implementation and compliance with recommendations and conditions of the EMPr as well as the EA. The Contractor must therefore:

» Ensure implementation and compliance with the EMPr at all times during construction activities and maintain, inter alia, an environmental register which keeps a record of all environmental incidents which occurs on the site during the construction of the Project.

» Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing, if reasonable).
» Implementation of corrective actions recommended by the EO/ Environmental Representative, for non-conformances recorded by the ECO, and Project Coordinator within a reasonable period.

These incidents may include:

» Public involvement / complaints;
» Health and safety incidents ;
» Incidents involving Hazardous materials stored on site; and/or
» Non-compliance incidents.

**EO/ Environmental Representative:** The Contractor's EO/ Environmental Representative (employed by the Contractor), is responsible for:

» Ensuring that the compliance of the EMPr, EA, and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensuring that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances.
» Implementation of all other environmental licenses required.
» Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Managing the day-to-day on-site implementation of this EMPr.
» Managing daily checklists, and weekly reports.
» Compilation of regular (usually weekly) Monitoring Reports.
» Liaise and advise on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

The Contractor's EO/ Environmental Respresentative should:

» Be well versed in environmental matters.
» Understand the relevant environmental legislation and processes.
» Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
» Know the background of the project and understand the implementation programme.
» Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
» Keep accurate and detailed records of all EMPr-related activities on site.

## 6.2 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

***OBJECTIVE 2: Minimise impacts related to inappropriate site establishment***

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Hazards to landowners and public<br>» Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located<br>» Loss of protected species |
| **Activities/Risk Sources** | » Excavations<br>» Movement of construction vehicles in the area and on-site |
| **Mitigation: Target/Objective** | » To secure the site against unauthorised entry<br>» To protect members of the public/landowners/residents<br>» No loss of or damage to sensitive vegetation in areas outside the immediate development footprint |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Secure site, working areas and excavations in an appropriate manner, as agreed with the Site Manager and EO. | Contractor | Site establishment, and duration of construction |
| Where necessary control access, fence, and secure | Contractor | Site |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| area | | establishment, and duration of construction |
| Fence and secure contractor's equipment camp/ laydown area | Contractor | Site establishment |
| Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager | Contractor | Site establishment and duration of construction |
| All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes | Contractor | Site establishment and duration of construction |
| Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel/chemicals to be required during construction) | Contractor | Site establishment |
| All development footprints should be appropriately fenced off and clearly demarcated | Contractor | Site establishment, and duration of construction |
| Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate walking distance. Provide sanitary bins for female workers | Contractor | Site establishment, and duration of construction |
| Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines or within 32m of a watercourse, whichever is greatest. | Contractor | Site establishment, and duration of construction |
| Supply adequate (closable, tamper proof) waste collection bins at site where construction is being undertaken | Contractor | Site establishment, and duration of construction |
| Separate bins should be provided for general and hazardous waste | Contractor | Site establishment, and duration of construction |
| As far as possible, provision should be made for separation of waste for recycling | Contractor | Site establishment, and duration of construction |

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| **Performance Indicator** | » Site is secure and there is no unauthorised entry<br>» No members of the public/ landowners injured as a result of the construction activities<br>» Appropriate and adequate waste management and sanitation facilities provided at construction site |
| **Monitoring** | » An incident reporting system must be used to record non-conformances to the EMPr<br>» ECO and EO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances must be immediately reported to the site manager |

***OBJECTIVE 3: Appropriate management of the construction site and construction workers***

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Damage to indigenous natural vegetation and sensitive areas<br>» Damage to and/or loss of topsoil (i.e. pollution, soil compaction etc.)<br>» Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities<br>» Pollution/contamination of the environment |
| **Activities/Risk Sources** | » Vegetation clearing and levelling of equipment storage area(s)/ laydown area(s)<br>» Access to and from the equipment storage area(s)/ laydown area(s)<br>» Ablution facilities<br>» Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment |
| **Mitigation: Target/Objective** | » Limit equipment storage to within demarcated designated areas<br>» Ensure adequate sanitation facilities and waste management practices<br>» Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| The siting of the construction equipment camp(s)/ laydown area(s) must take cognisance of any sensitive areas reflected on the sensitivity map | Contractor | Pre-construction |
| As far as possible, minimise vegetation clearing and | Contractor | Site |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| levelling for equipment storage area(s)/ laydown area(s) | | establishment, and during construction |
| Rehabilitate all disturbed areas as soon as construction is complete within an area, if practically possible. No exotic plants may be used in rehabilitation. Only indigenous plants of the area may be used | Contractor | Construction |
| Ensure waste containers are maintained and emptied on a regular basis | Contractor | Duration of construction |
| Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation/avoidance of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept. Topics must include:<br>» What is meant by "Environment"<br>» Why the environment needs to be protected and conserved<br>» How construction activities can impact on the environment<br>» Awareness of emergency and spills response provisions<br>» Social responsibility during construction activities, e.g. being considerate to local residents | Contractor | Duration of construction |
| Contractors must use chemical toilets/ablution facilities provided on site; no ablution facilities will be permitted outside the designated areas. A minimum of one toilet shall be provided per 15 persons or less at each working area such as the Contractor's camp | Contractor and sub-contractor/s | Duration of contract |
| Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. The ablutions facilities must be removed from site when construction is completed | Contractor | Duration of construction |
| Cooking and eating of meals must take place in a designated area | Contractor and sub-contractor/s | Duration of contract |
| No firewood or kindling may be gathered from the site or surrounds | Contractor and sub-contractor/s | Duration of contract |
| No open fires are permitted on site and construction | Contractor and | Duration of |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| personnel must be made aware of the consequences of starting a fire on site to avoid damage to neighbouring farms | sub-contractor/s | contract |
| All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste | Contractor and sub-contractor/s | Duration of contract |
| No plants may be collected from site for medicinal or any other purpose | Contractor | Duration of contract |
| No one may disturb flora or fauna in/outside of the demarcated construction area/s | Contractor and sub-contractor/s | Duration of contract |
| Fire-fighting equipment and training must be provided before the construction phase commences | Contractor and sub-contractor/s | Duration of contract |
| A Code of conduct for construction workers should be implemented | Contractor and sub-contractor/s | Construction |
| Contractors must ensure that all workers are informed of the conditions contained in the EMPr before commencing work, specifically consequences of stock theft and trespassing on adjacent farms | Contractor and sub-contractor/s | Construction |
| Construction workers, except for security personnel – if required, are not allowed to reside on site outside of working hours or without proper supervision | Contractor and sub-contractor/s | Duration of contract |
| On completion of the construction phase, all construction workers must leave the site | Contractor and sub-contractor/s | Construction |

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| **Performance Indicator** | » The construction equipment camps have avoided sensitive areas<br>» Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement<br>» All areas are rehabilitated promptly after construction in an area that has been completed, where practical<br>» Excess vegetation clearing and levelling is not undertaken<br>» No complaints regarding contractor behaviour or habits<br>» Appropriate training of all staff is undertaken prior to them commencing work on the construction site<br>» Code of conduct drafted before commencement of construction phase |
| **Monitoring** | » Regular audits of the construction camps and areas of construction on site by the ECO and/or EO |

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| | » Proof of disposal of sewage at an appropriate wastewater treatment works or proof of service slips from a relevant contractor<br>» An incident reporting system should be used to record non-conformances to the EMPr<br>» Observation and supervision of Contractor practices throughout construction phase by the ECO and EO<br>» Complaints must be investigated and, if appropriate, acted upon |

***OBJECTIVE 4: Maximise local employment associated with the construction phase***

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. Local labour should be used as far as possible.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » The opportunities and benefits associated with the creation of local employment and business |
| **Activities/Risk Sources** | » Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals<br>» Sourcing of individuals with skills similar to the local labour pool outside the municipal area |
| **Mitigation: Target/Objective** | » Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Construction workers should be recruited from the local areas, as far as possible | Contractor | Duration of construction |

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| **Performance Indicator** | » The involvement of local labour and previously disadvantaged individuals is promoted<br>» Labour, entrepreneurs, businesses, and Small, Medium and Micro-sized Enterprises (SMMEs) from the local sector are awarded jobs/ contracts, where practically possible, based on requirements in the tender documentation |
| **Monitoring** | » The Proponent and or appointed ECO must monitor indicators |

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| | listed above to ensure that they have been met for the construction phase |

## *OBJECTIVE 5: Minimise impacts related to traffic management and transportation of equipment and materials to site*

The construction phase of the project will be the most significant in terms of generating potential traffic impacts; resulting from the transport of equipment, materials and construction crews to the site and the return of the vehicles after delivery of materials.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Impact of construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals<br>» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted<br>» Deterioration of road pavement conditions (both surfaced and gravel road) due to increased traffic |
| **Activities/Risk Sources** | » Construction vehicle movement<br>» Speeding on local roads<br>» Degradation of local road conditions<br>» Site preparation and earthworks<br>» Foundations or plant equipment installation<br>» Transportation of ready-mix cement from off-site batching plant to the site, if required<br>» Mobile construction equipment movement on-site<br>» Construction activities related to the Project |
| **Mitigation: Target/Objective** | » Minimise impact of traffic on local traffic volume, existing infrastructure, property owners, animals, and road users<br>» To ensure all vehicles are roadworthy and all materials/ equipment are transported appropriately and within any imposed permit/licence conditions |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Strict vehicle safety standards should be implemented and monitored | Contractor | Construction |
| All relevant permits for abnormal loads must be applied for from the relevant authority | Contractor (or appointed transportation contractor) | Pre-construction |
| A designated access to the proposed site must be | Contractor | Pre- |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| created to ensure safe entry and exit | | construction |
| No unnecessary deviation from approved transportation or construction routes must be allowed, unless roads are closed for whatever reason outside the control of the Contractor | Contractor | Duration of contract |
| Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures | Contractor (or appointed transportation contractor) | Pre-construction |
| Any traffic delays resulting from the presence of construction traffic must be co-ordinated with the appropriate authorities | Contractor | Duration of contract |
| The movement of all vehicles within the site must be on designated roadways or tracks created for the purpose of construction, or where possible, on existing tracks as far as practically possible | Contractor | Duration of contract |
| Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards) | Contractor | Duration of contract |
| Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. Signage must be appropriately maintained for the duration of the construction period | Contractor | Duration of contract |
| A speed limit of 40km/h should be implemented for vehicles travelling on site in order to minimise dust generation and ensure safety of personnel and the environment and lessen environmental degradation | Contractor | Duration of contract |
| All construction vehicles and or machineries travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license | Contractor | Duration of contract |

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| **Performance Indicator** | » Vehicles keeping to the speed limits<br>» Vehicles are in good working order and safety standards are implemented<br>» Local residents and road users are aware of vehicle movements and schedules<br>» No construction traffic related accidents are experienced<br>» Local road conditions and road surfaces are not unnecessarily degraded by development<br>» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles)<br>» Drivers made aware of the potential safety issues and |

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| | enforcement of strict speed limits when they are employed |
| **Monitoring** | » Proponent, Contractor or appointed ECO (whichever is more applicable) must monitor performance indicators to ensure that they have been effectively implemented. |

***OBJECTIVE 6: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of livestock, game, other fauna and damage to farm infrastructure***

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity, due to "outsiders" being in the area, to undertake their criminal activities.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries |
| **Potential Impact** | » Impact on safety of farmers and communities (increased crime etc.) and potential loss of livestock due to stock theft by construction workers, illegal hunting or trapping of fauna and game, and also damage to farm infrastructure, such as gates and fences |
| **Activities/Risk Sources** | » The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts or illegal hunting/ trapping of fauna and or game. The activities of construction workers may also result in damage to farm infrastructure |
| **Mitigation: Target/Objective** | » To avoid and or minimise the potential impact on local communities and their livelihoods |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| The housing of construction workers on the site should be limited to security personnel, if required in addition to the security that will be at the Karusa Wind Farm site. | Contractor | Construction |
| Ensure that all farm gates are locked (when not in use) and secure (when in use) at all times | Contractor | Construction |
| Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners | Contractor | Pre-construction and when required |
| Contact details of emergency and police services | Contractor | Construction |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| should be prominently displayed on site | | |
| Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires | Contractor | Construction |
| Employees, visitors and/or subcontractors should be made well aware of the consequences of any damage to private property and/or loss of livestock, game and/or other fauna | Contractor | Duration of contract |
| Should there be any damage to private property and/or loss of livestock, game and/or other fauna that can be linked to the Contractor, or any subcontractor, the landowner shall be compensated accordingly upon sufficient proof thereof. | Project Company/Contractor | Duration of contract |
| Reasonable site access control should be implemented. | Contractor | Duration of contract |

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| **Performance Indicator** | » No criminal activities and theft of livestock, illegal hunting or trapping of game and/or other fauna attributable to the construction workers are reported<br>» No complaints received from landowners or the general public<br>» No fires or on-site accidents occur |
| **Monitoring** | » Proponent, Contractor or appointed ECO (whichever is more applicable) must monitor indicators listed above to ensure that they have been implemented |

## *OBJECTIVE 7: Management of dust and other air emissions*

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries |
| **Potential Impact** | » Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility |

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| | » Release of minor amounts of air pollutants (for example $NO_2$, $CO_2$ and $SO_2$) from vehicles and construction equipment |
| **Activities/Risk Sources** | » Clearing of vegetation and topsoil<br>» Excavation, grading, scraping, levelling, digging, drilling<br>» Transport of materials, equipment, and components on internal access roads/ tracks<br>» Re-entrainment of deposited dust by vehicle movements<br>» Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces<br>» Fuel burning from construction vehicles with combustion engines |
| **Mitigation: Target/Objective** | » To ensure emissions from all construction vehicles with combustion engines are minimised, where possible, for the duration of the construction phase<br>» To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Access roads must be maintained in a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive | Contractor | Construction |
| Ensure that any damage to roads attributed to construction activities is repaired before completion of the construction phase | Contractor | Construction |
| Appropriate dust suppressant must be applied on all exposed areas, stockpiles and gravel roads as required to minimise/control airborne dust. These could include the use of water or other appropriate dust suppressants, as determined by the local site conditions and in consultation with the ECO and/or EO | Contractor | Duration of contract |
| Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins | Contractor | Duration of contract |
| A speed limit of 40km/h should be implemented for vehicles travelling on site in order to minimise dust generation and ensure safety of personnel and the environment | Contractor | Duration of contract |
| Drivers must be made aware of the potential safety issues and enforcement of strict speed limits when they are employed | Contractor | Pre-construction |
| Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if excessive visible dust is blowing toward nearby residences outside the site | Contractor | Duration of contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities | Contractor | Completion of construction |
| Vehicles and equipment must be maintained in road-worthy condition at all times | Contractor | Duration of contract |

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| **Performance Indicator** | » No complaints from affected residents or community regarding dust or vehicle emissions<br>» Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase.<br>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and monitored on a monthly basis |
| **Monitoring** | » The ECO must monitor indicators listed above to ensure that they have been met for the construction phase.<br>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager<br>» An incident reporting system must be used to record non-conformances to the EMP<br>» Public complaints register must be developed and maintained on site |

***OBJECTIVE 8: Minimisation of development footprint and disturbance to topsoil***

In order to minimise impacts on flora, fauna and ecological processes, the development footprint should be limited as far as possible.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Impacts on natural vegetation and faunal habitats<br>» Impacts on soil<br>» Loss of topsoil |
| **Activity/Risk Source** | » Site preparation and earthworks<br>» Excavation of foundations<br>» Construction of site access roads<br>» Site preparation (e.g. compaction)<br>» Construction activities related to the Project<br>» Stockpiling of topsoil, subsoil and spoil material |
| **Mitigation: Target/Objective** | » To retain natural vegetation, where possible<br>» To minimise footprints of disturbance of vegetation/habitats<br>» Remove and store all topsoil on areas that are to be |

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| | excavated; and use this topsoil in subsequent rehabilitation of disturbed areas<br>» Minimise spoil material |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Stockpiled topsoil should be covered to prevent erosion if deemed necessary by the ECO/EO | Contractor | Site establishment & duration of contract |
| Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing | Contractor | Pre-construction |
| The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna and their habitats are restricted | Contractor | Site establishment & duration of contract |
| No activities must take place out of the demarcated construction site | Contractor | Site establishment & duration of contract |
| Any fill material required must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site | Contractor | Duration of contract |

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| **Performance Indicator** | » Minimal disturbance outside of designated work areas<br>» Minimise clearing of existing vegetation<br>» Topsoil appropriately stored |
| **Monitoring** | » Observation of vegetation clearing and soil management activities by ECO/EO throughout construction phase<br>» Supervision of all clearing and earthworks<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## *OBJECTIVE 9: Minimise the impacts on and loss of indigenous vegetation and faunal habitat and fauna*

The extent of the development footprint area is very limited and furthermore restricted to an area already transformed by the existing infrastructure. The majority of the site can be regarded as low sensitive with the exception of the rocky patch (High Sensitive – refer to Figure 1.2)) and drainage lines (Medium Sensitive). A permit will be required for the removal or relocation of any protected plant species where they are to be affected.

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| **Project component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Clearing of natural vegetation<br>» Construction activities<br>» Traffic to and from site |
| **Activity/risk source** | » Site preparation and earthworks<br>» Construction-related traffic<br>» Foundations or plant equipment installation<br>» Mobile construction equipment<br>» Construction activities related to the Project<br>» Dumping or damage by construction equipment outside of demarcated construction areas |
| **Mitigation: Target/Objective** | » To retain natural vegetation in the high and moderate sensitive areas on the site<br>» To minimise footprints of disturbance of vegetation/habitats on-site<br>» To protect fauna |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| Areas containing protected plant species must be noted and every effort made to reduce the impacts of construction on these areas. Protected plant species in any area to be cleared should be identified and rescued. Permits will be required from NC DENC to remove or translocate protected plant species, if they are to be affected. | Contractor in consultation with Specialist | Pre-construction and construction |
| Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing. In this regard, staff/ employees must be educated to keep construction activities within the demarcated areas. | Contractor | Pre-construction and construction |
| The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that the impact on flora is restricted. | Contractor | Site establishment & duration of contract |
| A site rehabilitation programme must be implemented. | Contractor in consultation with Specialist | Duration of contract |
| Protected plants identified within the development footprint must not be disturbed or removed prior to a relevant permit being granted | Contractor | Construction |
| Employees must be prohibited from harvesting wild plants for any purpose | Contractor | Duration of contract |
| Restrict construction activities to post-dawn and pre- | Contractor | Construction |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| dusk | | |
| Enforce speed limits of 40km/h within the construction site | Contractor | Construction |
| ECO and EO must inspect the immediate vegetation for evidence of snares. | Contractor/ECO /EO | Construction |
| Any fauna directly threatened by the construction activities should be removed to a safe location with similar environment or 1 km away from worksite. by the ECO or other suitably qualified person, e.g. the EO. | Contractor/ECO /EO | Pre-construction and construction |
| Construction staff should undergo an environmental induction at the start of the project to ensure that they are aware of the appropriate response to the presence of fauna at the site and do not kill or harm fauna such as snakes or other reptiles which are often feared. | Contractor/ECO /EO | Pre-construction and construction |

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| **Performance Indicator** | » No disturbance outside of designated work areas<br>» Minimised clearing of existing/natural vegetation<br>» Limited impacts on areas of identified and demarcated sensitive habitats/vegetation<br>» No trapping or killing of fauna illegally |
| **Monitoring** | » Observation of vegetation clearing activities by ECO or the Contractor's EO throughout construction phase<br>» Supervision of all clearing and earthworks by ECO or the Contractor's EO<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## *OBJECTIVE 10: Limit impacts on drainage lines*

Drainage line(s), although some are degraded, is considered to be of a medium-high sensitivity due to them being considered vulnerable to erosion and degradation if not managed appropriately. According to the ecological study undertaken, the proposed project may impact on the drainage line. However if drainage lines are already degraded and experiencing reduction in flow due to existing impacts, road crossings, where required, could improve flow conditions if the relevant design measures are implemented (as noted below).

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| **Project component/s** | » Power line<br>» Ancillaries |

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| | » |
| **Potential Impact** | » Damage to the watercourse (such as erosion, siltation, dumping of waste) that will impact on ecosystem functioning.<br>» Improved flow conditions (positive impact) |
| **Activity/risk source** | » Construction, environmental management. |
| **Mitigation: Target/Objective** | No damage to the drainage line within the project area. |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| The engineering team must provide effective means to minimise the potential downstream effects of sedimentation and erosion (erosion protection) as well as minimise the loss of vegetation responsible of stabilising the soil and potentially increase flow conditions. | Contractor, Engineer | Duration of construction |
| No vehicles to refuel within the drainage line. | Contractor, Engineer | Design and construction |
| Disturbed areas should be rehabilitated and re-vegetated as soon as possible. | Contractor, Engineer | Duration of construction |
| Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers. | Contractor, Engineer | Duration of construction |
| Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. | Contractor, Engineer | Duration of construction |

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| **Performance Indicator** | » No disturbance outside of designated work areas;<br>» Minimised clearing of existing/natural vegetation;<br>» Improved flow conditions; and<br>» Limited impacts on areas of identified and demarcated sensitive habitats/vegetation. |
| **Monitoring** | » An ECO/EO should monitor the habitat loss before and after construction.<br>» The drainage lines should be monitored for the presence and development of erosion features downstream of any construction on site. |

***OBJECTIVE 11: Minimise the establishment and spread of alien invasive plants***

On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis. Some alien invasive plant species occur in the study area and there is a potential for alien plants to spread or become established following disturbance on site.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species |
| **Activities/Risk Sources** | » Construction |
| **Mitigation: Target/Objective** | » No alien plants within project control area during the construction and operation phases |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Avoid creating conditions in which alien plants may become established:<br>» Keep disturbance of indigenous vegetation to a minimum.<br>» Rehabilitate disturbed areas as quickly as possible.<br>» Do not import soil from areas with alien plants. | Contractor | Construction |
| Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act) | Contractor | Construction |
| Immediately control any alien plants that become established using registered control methods | Contractor | Construction |

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| **Performance Indicator** | » Disturbed areas rehabilitated, if area does not establish naturally, and at least 40% plant cover achieved on rehabilitated sites over a period of 2 to 5 years<br>» Site free of erosion and alien invasive plants |
| **Monitoring** | » On-going monitoring of area by EO during construction<br>» If any alien invasive species are detected then the distribution of these should be mapped and investigated<br>» The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area<br>» Reporting frequency depends on legal compliance framework |

***OBJECTIVE 12: Minimise soil degradation and erosion***

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere.
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage lines.
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Soil and rock degradation<br>» Soil erosion<br>» Increased deposition of soil into drainage systems<br>» Increased run-off over the site |
| **Activities/Risk Sources** | » Removal of vegetation, excavation, stockpiling, compaction and pollution of soil through uncontrolled spillage<br>» Rainfall - water erosion of disturbed areas<br>» Wind erosion of disturbed areas<br>» Concentrated discharge of water from construction activity |
| **Mitigation: Target/Objective** | » Minimise extent of disturbance areas<br>» Minimise activity within disturbance areas<br>» Minimise soil degradation (mixing, wetting, compaction, etc.)<br>» Minimise soil erosion<br>» Minimise deposition of soil into drainage lines<br>» Minimise instability of embankments/excavations |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Identify disturbance areas and restrict construction activity to these areas | Contractor | Before and during construction |
| Rehabilitate disturbance areas as soon as practicable when construction in an area is complete | Contractor | During and after construction |
| Any new access roads are required to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil | Engineer<br>Contractor | Design and construction |
| Minimise unnecessary removal of vegetation which | Contractor | Construction |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| adds stability to soil | | |
| Excavated topsoil must be stockpiled in designated areas separate from base material at a maximum height of 2m and covered (during windy conditions) or vegetated until replaced during rehabilitation | Contractor | Site establishment & duration of contract |
| Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur. ECO/EO to monitor this activity. | Contractor/ECO /EO | Site establishment Maintenance: for duration of contract |
| Implement appropriate erosion control measures (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, or temporary mulching over denuded area as required) | Contractor | Erection: Before construction Maintenance: Duration of contract |
| Control depth of excavations and stability of cut faces/sidewalls using appropriate methods | Contractor | Duration of contract |
| Implement an appropriate storm water management plan | Contractor | Duration of construction |

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|---|---|
| **Performance Indicator** | » No activity outside demarcated disturbance areas<br>» Minimal level of soil erosion around site<br>» No activity in restricted areas |
| **Monitoring** | » On-going inspections of the site by the ECO and EO<br>» Monthly inspections of erosion control devices<br>» Immediate reporting of ineffective erosion and sediment control systems<br>» An incident reporting system must be in place to record non-conformances |

## *OBJECTIVE 13: Protection of heritage resources*

One stone artefact was documented on the Farm Standvastigheid 210 along the proposed power line route toward the Komsberg Substation. Two dry packed stone wall features intersect the same power line route on the Farm Standvastigheid 210. Considering that the proposed power line is overhead, it should not affect the stone wall features negatively as long as pylons are micro-sited to avoid these features.

| | |
|---|---|
| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries |

| | |
|---|---|
| | » |
| **Potential Impact** | » Heritage objects/ artefacts/ unidentified sites/ burial and grave sites found on site are inappropriately managed or destroyed |
| **Activity/Risk Source** | » Site preparation and earthworks<br>» Foundations or plant equipment installation<br>» Mobile construction equipment movement on site<br>» |
| **Mitigation: Target/Objective** | » To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas | Contractor & EO | Pre-construction |
| Project employees and any contract staff will maintain, at all times, a high level of awareness of the possibility of discovering heritage sites. Familiarise all staff and contractors with procedures for dealing with heritage objects/sites if uncovered | Proponent/ Contractor | Duration of contract |
| Construction managers/foremen should familiarise himself/herself before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow if they find sites. The ECO and the contractor's EO may be trained to identify/ follow the relevant procedure and report to the site manager if heritage sites are found. | Contractor | Duration of contract |
| If the current layout is changed significantly, i.e. outside of the assessed footprint, an archaeological walk-through survey of the changes must be conducted and further mitigatory recommendations may be made if necessary. | Proponent/Specialist | Pre-construction |
| The dry packed stone walls must be avoided by locating the positions of the pylons a minimum of 30 m from any stone packed feature. It is therefore unlikely that the dry packed stone walls and stone packed features will be negatively affected by the construction of the power lines, however, precautions must be taken as to avoid impact during construction activities. | ECO/ EO/ Environmental representative, Proponent | Pre-construction |
| A person must be trained as a site monitor to report any archaeological sites found during the development. Construction managers/foremen and/or the ECO/ EO/ Environmental Representative should be informed before construction starts on | ECO/ EO/ Environmental Representative, Contractor | Pre-construction |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. | | |
| If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including graves and burials) are potentially uncovered during construction, all work in the immediate area affecting the find must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) and/or the MacGregor Museum, Kimberly (+27 (0) 53 839 2706 Or 021 462 4502), so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue. | Proponent , and Contractor in consultation with Specialist | Duration of contract |

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| **Performance Indicator** | » No unnecessary disturbance outside of designated work areas<br>» All heritage items located are dealt with as per the legislative guidelines<br>» Project employees and any contract staff aware of potential for uncovering heritage materials during construction |
| **Monitoring** | » Observation of clearing and excavation activities by EO throughout construction phase<br>» Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites, if applicable<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## *OBJECTIVE 14: Minimisation of visual impacts associated with construction*

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users, albeit for a limited period. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the project. Secondary visual

impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Visual impact of general construction activities<br>» Potential scarring of the landscape due to vegetation clearing |
| **Activity/Risk Source** | » The viewing of the above mentioned by observers on or near the site |
| **Mitigation: Target/Objective** | » Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Ensure that vegetation is not unnecessarily removed during the construction period | Contractor | Planning |
| Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources | Contractor | Planning |
| Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible | Contractor | Construction |
| Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads/ tracks | Contractor | Construction |
| Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities | Contractor | Construction |
| Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent) | Contractor | Construction |
| Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts | Contractor | Construction |
| Rehabilitate all disturbed areas immediately after the completion of construction works | Contractor | Construction |

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| **Performance Indicator** | » Vegetation cover near the site is intact with no evidence of degradation or erosion<br>» Construction site is kept in a neat and tidy state |
| **Monitoring** | » Monitoring of vegetation clearing during the construction phase |

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| | by the EO<br>» Monitoring of rehabilitation activities to ensure appropriate rehabilitation of the site<br>» An incident reporting system will be used to record non-conformances to the EMPr<br>» Public complaints register must be developed and maintained on site |

## *OBJECTIVE 15: Noise control*

Traffic movement to and from the site, particularly of heavy-duty vehicles during construction, could potentially result in a noise impact.

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| **Project component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Nuisance noise from construction affecting the surrounding communities |
| **Activity/risk source** | » Site preparation and earthworks<br>» Construction-related transport<br>» Foundations or plant equipment installation |
| **Mitigation: Target/Objective** | » To minimise noise to any surrounding residences from the construction activities<br>» To comply with Noise Control Regulations and SANS Guidelines<br>» To ensure noise levels are acceptable at residences in close proximity to construction activities |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| On-site construction activities should be limited to daylight hours as far as possible | Contractor | Duration of contract |
| Construction noise shall be managed according to the Noise Control Regulations and SANS 10103 | Contractor | Duration of contract |
| All construction equipment, including vehicles, must be properly and appropriately maintained in order to minimise noise generation, e.g. silencers must be in good working order | Contractor | Duration of contract |

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| **Performance Indicator** | » No complaints received concerning noise |
| **Monitoring** | » A complaints register must be maintained, in which any |

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| | complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## *OBJECTIVE 16: Appropriate handling and management of waste*

The main wastes expected will include spoil from excavation activities, general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage). In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Inefficient use of resources resulting in excessive waste generation<br>» Litter or contamination of the site or water through poor waste management practices |
| **Activity/Risk Source** | » Packaging<br>» Other construction wastes<br>» Hydrocarbon use and storage<br>» Spoil material from excavation, earthworks, and site preparation |
| **Mitigation: Target/Objective** | » To comply with waste management legislation<br>» To minimise production of waste<br>» To ensure appropriate waste storage and disposal<br>» To avoid environmental harm from waste disposal<br>» A waste manifest should be developed for the ablutions showing proof of disposal of sewage at appropriate wastewater treatment works |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files. | Contractor | Duration of contract |
| Any spills will receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and | Contractor | Duration of contract |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan) | | |
| Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with | Contractor | Duration of contract |
| Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or e.g. large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils | Contractor | Duration of contract |
| Transport of all hazardous substances must be in accordance with the relevant legislation and regulations | Contractor | Duration of contract |
| Waste disposal records must be available for review at any time | Contractor | Duration of contract |
| Construction contractors must provide specific detailed waste management plans to deal with all waste streams | Contractor | Duration of contract |
| Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control | Contractor | Duration of contract |
| Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.) | Contractor | Duration of contract |
| Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites | Contractor | Duration of contract |
| Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area | Contractor | Duration of contract |
| Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste contractors to sites designated for their disposal | Contractor | Duration of contract |
| Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste | Contractor | Duration of contract |
| An incident/complaints register must be established and maintained on-site | Contractor | Duration of contract |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered | Contractors | Erection: during site establishment Maintenance: for duration of Contract within a particular area |
| All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site | Contractors | Erection: during site establishment Maintenance: for duration of Contract within a particular area |
| Supply waste collection bins at construction equipment and construction crew camps | Contractors | Erection: during site establishment Maintenance: for duration of Contract within a particular area |
| Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised | Contractor | Duration of contract |
| All stored fuels to be maintained within a bund and on a sealed surface | Contractor | Duration of contract |
| Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function | Contractor | Duration of contract |
| Construction machinery must be stored within a bunded area and on a sealed surface | Contractor | Duration of contract |
| Oily water from bunds at the substation must be removed from site by licensed contractors | Contractor | Duration of contract |
| Spilled cement and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site | Contractor | Duration of contract |
| Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures | Contractor | Duration of contract |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Spill kits to be kept on-site | Contractor | Duration of contract |
| Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility | Contractor | Duration of contract |
| Upon the completion of construction, the area will be cleared of potentially polluting materials | Contractor | Completion of construction |

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| **Performance Indicator** | » No complaints received regarding waste on site or indiscriminate dumping<br>» Availability of all appropriate waste manifests for all waste streams |
| **Monitoring** | » Observation of waste management practices throughout construction phase by EO and contractor<br>» Supervision of waste management practices throughout construction phase by EO and contractor<br>» A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## *OBJECTIVE 17: Appropriate handling and storage of chemicals and hazardous substances*

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Release of contaminated water from contact with spilled chemicals<br>» Generation of contaminated wastes from used chemical containers |
| **Activity/Risk Source** | » Vehicles associated with site preparation and earthworks<br>» Construction activities of area and linear infrastructure |

| | |
|---|---|
| | » Hydrocarbon use and storage |
| **Mitigation: Target/Objective** | » To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons or animals<br>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons or animals |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Appropriate spill kits must be made available on-site for the clean-up of spills and leaks of contaminants | Contractor | Duration of contract |
| Corrective action must be undertaken immediately if a potential/actual leak or spill of a polluting substance is identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures | Contractor | Duration of contract |
| In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents | Contractor | Duration of contract |
| Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site | Contractor | Duration of contract |
| Any contaminated/polluted soil can be stored onsite to a maximum of 90 days before having to be removed from the site and must be disposed of at a licensed hazardous waste disposal facility. If not removed from the site within 90 days, it could require a Waste Management License. | Contractor | Duration of contract |
| Routine servicing and maintenance of vehicles must not take place on-site but on designated bunded areas at the camp (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils leaks | Contractor | Duration of contract |
| All stored fuels must be maintained within a bunded area and on a sealed surface | Contractor | Duration of contract |
| Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function | Contractor | Duration of contract |
| Small construction machineries (i.e. stumpers, generators etc.) must be stored in an appropriately sealed area | Contractor | Duration of contract |
| The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with | Contractor | Duration of contract |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Material Safety Data Sheets (MSDS) files | | |
| Drip trays must be placed under stationery machineries in sensitive areas | Contractor | Duration of contract |
| Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals must be compiled with | Contractor | Duration of contract |
| Transport of all hazardous substances must be in accordance with the relevant legislation and regulations | Contractor | Duration of contract |
| All small chemical substances used onsite must be accompanied by a portable drip tray to store them | Contractor | Duration of contract |
| Construction vehicles must be washed within designated area, agreed with the EO and the site manager | Contractor | Duration of contract |
| The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times | Contractor | Duration of contract |
| Upon the completion of construction, the area must be cleared of potentially polluting materials | Contractor | Completion of construction |

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|---|---|
| **Performance Indicator** | » No chemical spills outside of designated storage areas<br>» No unattended water or soil contamination by spills<br>» No complaints received regarding waste on site or indiscriminate dumping |
| **Monitoring** | » Supervision of waste management practices throughout construction phase by EO and contractor<br>» A complaints register must be maintained, in which any complaints from the community will be logged<br>» An incident reporting system must be used to record non-conformances to the EMPr |

## 6.3 Detailing Method Statements

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will be practically mitigated and managed for the duration of the contract, or for the time period in which that risk will exist, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager and ECO, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager and ECO is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

» Responsible person/s;
» Construction procedures;
» Materials and equipment to be used;
» Getting the equipment to and from site;
» How the equipment/material will be moved while on-site;
» How and where material will be stored;
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
» Timing and location of activities;
» Compliance/non-compliance with the Specifications; and
» Any other information deemed necessary by the Site Manager and/or ECO.

Specific method statements required may include, *inter alia*:

» Site establishment
» Preparation of the site
» Soil management/stockpiling and erosion control.
» Excavations and backfilling procedure.
» Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions, if applicable)
» Storm water management procedures
» Wash bay for the construction vehicles and or machineries
» Ablution facilities (placement, maintenance, management and servicing)
» Solid Waste Management:
» Liquid waste management:
» Dust and noise pollution
» Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
» Fire prevention and management measures on site.
» Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
» Incident and accident reporting protocol.

» General administration
» Designate access road/ tracks and the protocol while roads are in use.
» Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been provided to, reviewed and accepted by the Site Manager and/or ECO, except in the case of emergencies and then only with the consent of the Site Manager. Review and acceptance (or approval where required) of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO must monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement(s).

## 6.4 Awareness and Competence: Construction Phase

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMPr is readily available on-site, and that all site employees are aware of the location and have access to the document.
» Employees shall be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the Project.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course (see 6.4.1 below).
    o The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Awareness of any other relevant environmental matters, which are deemed necessary by the ECO.

» Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
» Ensure that employees receive environmental awareness training.
» Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" are erected at prominent locations throughout the site.
» Records must be kept of those that have completed the relevant training.
» Refresher sessions must be held annually to ensure the contractor staffs are aware of their environmental obligations as practically possible, detailed below.

### *6.4.1 Environmental Awareness Training*

Environmental Awareness Training must take the form of an on-site talk and demonstration by the ECO and Contractor's EO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the ECO and Contractor's EO on site. Proof of awareness training should be kept on record.

### *6.4.2 Induction Training*

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to the site.

This induction training should include discussing the proponent's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the contractual and legal repercussions of non-compliance (penalty fees will be outlined in the service level agreement between the proponent and the contractor). The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the EO on site. Proof of induction training should be kept on record.

### *6.4.3 Toolbox Talks*

Toolbox talks should be held on a scheduled and regular basis (at least twice a month/ if when necessary) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and ones recommended by the onsite ECO/EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

## 6.5 Monitoring Schedule: Construction Phase

A monitoring schedule should be in place internally not only to ensure conformance with the conditions of the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The independent ECO will be responsible for monitoring for the most part although will include others on a needs basis (also refer to section 6.5.2 below). The Project Manager will ensure that the internal monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
» Ensure adequate and appropriate interventions to address non-compliance.
» Ensure adequate and appropriate interventions to address environmental degradation.
» Provide a mechanism for the lodging and resolution of public complaints.
» Ensure appropriate and adequate record keeping related to environmental compliance.

### *6.5.1. Non-Conformance Reports*

All supervisory staff including Foremen, Engineers, and the ECO and EO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the

remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO/EO.

### *6.5.2. Monitoring Reports*

Monitoring reports will be compiled by the ECO on a monthly basis and, if requested, must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded if any, corrective action required, and details of those non-conformances or incidents which have been closed out.

### *6.5.3. Final Audit Report*

A final Environmental Audit Report must be compiled by an independent auditor and be submitted to DEA upon completion of the construction and rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the Environmental Authorisation conditions and the requirements of the EMPr.

# MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

**Overall Goal:** Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

## 7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

***OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed***

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

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| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
| **Potential Impact** | » Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention |
| **Activity/Risk Source** | » Temporary construction areas<br>» Temporary access roads/tracks<br>» Other disturbed areas/footprints |
| **Mitigation: Target/Objective** | » Ensure and encourage site rehabilitation of disturbed areas<br>» Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| All temporary facilities, equipment, and waste materials (including spoil material) must be removed from site | Contractor | Following execution of the works |
| All temporary fencing and danger tape must be | Contractor | Following |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| removed once the construction phase has been completed | | completion of construction activities in an area |
| The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up | Contractor | Following completion of construction activities in an area |
| All hardened surfaces within the construction equipment camp area, not forming part of permanent laydown areas, should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated | Contractor | Following completion of construction activities in an area |
| Temporary roads must be closed and access across these blocked | Contractor | Following completion of construction activities in an area |
| Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion | Contractor | Following completion of construction activities in an area |
| Rehabilitation must be in line with the requirements of the landowner for the land use (except in those areas of remaining natural vegetation which are disturbed) | Contractor in consultation with rehabilitation specialist | Following completion of construction activities in an area |
| Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved | Contractor in consultation with rehabilitation specialist | Post-rehabilitation |
| Erosion control measures should be used in sensitive areas | Contractor in consultation with rehabilitation specialist (if required) | Post-rehabilitation |
| Alien plant management must be undertaken as per the alien management and monitoring plan to be developed pre-construction | Contractor | Post-rehabilitation |
| Topsoil replaced on all areas and stabilised where | Contractor | Rehabilitation |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| practicable | | |

| | |
|---|---|
| **Performance Indicator** | » All areas of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities<br>» Topsoil replaced on all areas and stabilised where practicable or required after construction and temporarily utilised areas<br>» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites<br>» Appropriate vegetation utilised in rehabilitation activities<br>» Complete development area free of alien invasive plants |
| **Monitoring** | » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented<br>» On-going alien plant monitoring and removal should be undertaken on an annual basis as per the alien monitoring and management plan to be developed pre-construction<br>» An incident reporting system must be used to record non-conformances to the EMPr |

# MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

**Overall Goal:** To ensure that the operation of the proposed infrastructure does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables the proposed facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
» Minimises impacts on fauna using the site.

An Environmental Manager must ensure the implementation of the operational EMPr.

## 8.1. Objectives

In order to meet this goal, the following objectives have been identified, together With necessary actions and monitoring requirements.

***OBJECTIVE 1: Protection of Indigenous natural vegetation and fauna, and maintenance of rehabilitated areas***

| | |
|---|---|
| **Project component/s** | » Service roads utilised during regular maintenance<br>» Power line servitude<br>» Areas disturbed during the construction phase and subsequently rehabilitated |
| **Potential Impact** | » Disturbance to or loss of vegetation and/or habitat |
| **Activity/Risk Source** | » Movement of employee vehicles within and around site |
| **Mitigation:** | » Maintain minimised footprints of disturbance of |

| | |
|---|---|
| **Target/Objective** | vegetation/habitats on-site<br>» Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| Vehicle movements must be restricted to designated roadways | Contractor and Proponent | Operation |
| No disturbance of vegetation outside of the project site must occur | Contractor and Proponent | Operation |
| Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways | Contractor and Proponent | Operation |
| An on-going alien plant monitoring and eradication programme must be implemented, where necessary | Contractor and Proponent | Operation |

| | |
|---|---|
| **Performance Indicator** | » No further disturbance to vegetation or terrestrial faunal habitats<br>» Continued improvement of rehabilitation efforts<br>» No disturbance of vegetation outside of project site |
| **Monitoring** | » Regular inspection to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas |

## *OBJECTIVE 2: Protection of avifauna*

During operation, electrocutions within the Switching Station and electrocution by the power line could potentially have a negative impact on a variety of bird species, particularly those species that regularly utilize the electrical infrastructure to perch, or breed and nest as well as those tolerant of disturbances e.g. crows, herons, sparrows, owls, kestrels, falcons and geese. Nesting of small passerine birds, crows or ravens on or within Switching Station infrastructure may also lead to electrocutions and outages. Mitigation measures may reduce the number of electrocutions and outages, with the resulting impact significance being Low.

| | |
|---|---|
| **Project Component/s** | » Power line<br>» Switching Station<br>» |
| **Potential Impact** | » Collision and electrocution events with the overhead power line<br>» Electrocution at switching station |
| **Activities/Risk Sources** | » Operation of the power line and substation complex without appropriate mitigation measures |

| | |
|---|---|
| **Mitigation: Target/Objective** | » Maintain a low number of collision and electrocution events |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| All BFDs must be checked regularly, e.g. this can be combined with general maintenance activities, and be replaced if they are damaged or have fallen off the power line. | Contractor | Operation |
| Develop and implement a carcass search programme for birds during the first two years of operation of the power line and switching station that must include monitoring of the new overhead power line for mortalities. | Contractor | Operation |
| No nests may be removed, without first consulting the Endangered Wildlife Trust's (EWT) Wildlife and Energy Programme (WEP). | Contractor | Operation |
| Any overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' structures, with clearances between live components of 1.8 m or greater. | Contractor | Operation/planning |
| Bird perch deterrents and physical exclusion barriers, frames and covers may reduce incidence of birds perching and nesting on substation infrastructure. | Contractor | Operation/planning |
| Insulating, covering or isolating hardware (e.g. >180 cm between phase conductors or phase conductors and grounded infrastructure) may reduce electrocutions and outages. | Contractor | Operation/planning |
| Electrocutions to be monitored and recorded along the power line route as a component of the Project's operational monitoring programme, and reported to the EWT's WEP to determine if further mitigation action is required. | Contractor | Operation |
| Potential Faulting (caused by nesting and perching of birds on structures in the substation) may require detailed, site specific mitigation dependent on the precise design and equipment in the new substation. Upon completion of construction, or during planning, an avifaunal specialist is to be contacted to determine if mitigation is required and if so, what mitigation measures are to be implemented. | Contractor | Operation/planning |

| | |
|---|---|
| **Performance** | » Minimal collision or electrocution events |

| **Indicator** | |
|---|---|
| **Monitoring** | » Observation of electrocution or collision events with the power line<br>» Monitor the substation area for mortalities |

## *OBJECTIVE 3: Minimise soil degradation and erosion*

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site if not managed sufficiently.
» Uncontrolled run-off relating to operational activities could also lead to accelerated erosion and possible sedimentation of drainage systems.
» Degradation of the natural soil profile due to pollution.

| **Project Component/s** | » Power line<br>» Switching Station; and<br>» Ancillaries<br>» |
|---|---|
| **Potential Impact** | » Soil degradation<br>» Soil erosion<br>» Increased deposition of soil into drainage systems<br>» Increased run-off over the site |
| **Activities/Risk Sources** | » Poor rehabilitation of cleared areas<br>» Rainfall - water erosion of disturbed areas<br>» Wind erosion of disturbed areas<br>» Concentrated discharge of water from construction activity |
| **Mitigation: Target/Objective** | » Ensure rehabilitation of disturbed areas is maintained<br>» Minimise soil degradation (i.e. wetting)<br>» Minimise soil erosion and deposition of soil into drainage lines<br>» Ensure continued stability of embankments/excavations |

| **Mitigation: Action/Control** | **Responsibility** | **Timeframe** |
|---|---|---|
| Rehabilitate disturbance areas should the previous attempt be unsuccessful | Contractor | Operation |
| All bare areas should be revegetated with locally occurring species, to bind the soil and limit erosion potential. | Contractor | Operation |
| Maintain erosion control measures implemented during the construction and rehabilitation phases (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets) if | Contractor | Operation |

| Mitigation: Action/Control | Responsibility | Timeframe |
|---|---|---|
| deemed necessary | | |

| | |
|---|---|
| **Performance Indicator** | » Minimal soil erosion around site |
| **Monitoring** | » Immediate reporting of ineffective sediment control systems<br>» An incident reporting system must record non-conformances according to the EMPr |

# MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

It is most likely that decommissioning activities of the infrastructure would comprise the disassembly and removal of the Project infrastructure.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered at any relevant and competent authority at that time.

The relevant mitigation measures contained under the construction EMPr (Chapter 6) should be applied during decommissioning, if still applicable at the time, and therefore is not repeated in this section. The EMPr for Rehabilitation (chapter 7) is also relevant to the decommissioning of the proposed infrastructure and must be adhered to. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time. This section of the EMPr will need to be revisited and amended at the time in accordance with the applicable legislation.

# FINALISATION OF THE EMPR CHAPTER 10

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

# APPENDIX A:
# PROPOSED GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

## GRIEVANCE MECHANISM / PROCESS

### AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

» Fair and equitable;
» Open and transparent;
» Accountable and efficient.

The Proponent has an overarching Grievance Mechanism that will be implemented to ensure effective and efficient management of grievances/ concerns raised by local landowners and or communities.

# APPENDIX B:
# CURRICULA VITAE FOR THE SAVANNAH ENVIRONMENTAL PROJECT TEAM AND SPECIALIST CONSULTANTS

**CURRICULUM VITAE**
**JO-ANNE THOMAS**

| | | |
|---|---|---|
| Profession | : | Environmental Consultant |
| Specialisation | : | Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology |
| Years experience | : | Sixteen (16) years in the environmental field |

## KEY RESPONSIBILITIES

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Key focus on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management; review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Undertaking of numerous environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements. Recent projects have been undertaken for both the public- and private-sector, including compliance advice and monitoring, electricity generation and transmission projects, various types of linear developments (such as National Road, local roads and power lines), waste management projects (landfills), mining rights and permits, policy, strategy and guideline development, as well as general environmental planning, development and management.

## SKILLS BASE AND CORE COMPETENCIES

- Project management for a range of projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data and specialist studies
- Identification of practical and achievable mitigation and management measures and the development of appropriate management plans
- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- External and peer review of environmental reports & compliance advice and monitoring
- Formulation of environmental policies, strategies and guidelines
- Strategic and regional assessments; pre-feasibility & site selection
- Public participation processes for a variety of projects
- Strategic environmental advice to a wide variety of clients both in the public and private sectors
- Working knowledge of environmental planning processes, policies, regulatory frameworks and legislation

**EDUCATION AND PROFESSIONAL STATUS**

***Degrees:***

B.Sc Earth Sciences, *University of the Witwatersrand, Johannesburg,* 1993
B.Sc Honours in Botany, *University of the Witwatersrand, Johannesburg,* 1994
M.Sc in Botany, *University of the Witwatersrand, Johannesburg,* 1996

***Courses:***

Environmental Impact Assessment, *Potchefstroom University,* 1998
Environmental Law, *Morgan University*, 2001

***Professional Society Affiliations:***

Professional Natural Scientist (Registration No 400024/00).

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**EMPLOYMENT**

*Current:* Director of Savannah Environmental (Pty) Ltd. Independent specialist environmental consultant

*October 1997-November 2005:* Bohlweki Environmental (Pty) Ltd: Senior Environmental Scientist; Environmental Management and Project Management

*January to July 1997:* Junior Science Teacher, Sutherland High School, Pretoria

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**PROJECT EXPERIENCE**

Current projects include:

***Compliance Advice and Due Diligence***

- First annual Environmental and Social Monitoring Report for the Upington Airport 10MW PV Plant, Northern Cape Province
- Compliance advice for Financial Close of the Ilanga CSP Facility, Northern Cape Province
- Compliance advice for Financial Close of West Coast One Wind Energy Facility, Western Cape Province
- Compliance advice for Financial Close of Tsitsikamma Wind Energy Facility, Eastern Cape Province
- Compliance advice for Financial Close of Upington Solar Facility, Northern Cape Province
- Environmental Due Diligence of a wind energy facility in the Western Cape on behalf of EDPR Renewables
- Environmental Due Diligence of a wind energy facility on the West Coast of the Western Cape on behalf of ILF&S

***Compliance Monitoring***

- Project manager and auditor - ECO compliance monitoring for the construction of the De Hoop Dam and the deviation of the R555, Limpopo Province
- Project manager – ECO compliance at Kathu Solar Energy Facility, Northern Cape Province
- Project manager – ECO compliance at West Coast One Wind Energy Facility, Western Cape Province

- Project manager – ECO compliance at Sishen Solar Energy Facility, Northern Cape Province
- Project manager – ECO compliance monitoring for the expansion of Waterval WCW, Gauteng Province
- Project manager - ECO compliance monitoring for the Mine Water Recovery Project at Duvha Power Station, Mpumalanga Province
- Project manager – ECO compliance at Dorper Wind Energy Facility, Eastern Cape Province
- Project manager – ECO compliance monitoring for the !Khi CSP Facility near Upington, Northern Cape
- Project manager – ECO compliance at Gouda Energy Facility, West Coast Province
- Project manager – ECO compliance monitoring for the KaXu! CSP facility near Pofadder, Northern Cape
- Project manager – ECO compliance monitoring for the Upington Airport PV facility at Upington, Northern Cape Province
- Project manager – ECO compliance at RustMo1 Solar Energy Facility, North West Province
- Project manager – Environmental Officers for Gamma-Kappa 765kV power line between Laingsburg and Beaufort West, Western Cape
- Project manager – ECO compliance monitoring for the rehabilitation of Blaauwpan Dam, Gauteng Province

***Electricity Sector Projects: Coal-fired Power Stations***

- Project manager for the EIA undertaken for the proposed Independent power Producer (IPP) Coal-fired Power Station and associated infrastructure near Lephalale within the Waterberg District Municipality of the Limpopo Province
- Project manager for the EIA undertaken for the proposed Umbani Coal-fired Power Station and associated infrastructure near Kriel, Mpumalanga Province
- Project manager for the EIA undertaken for the proposed Ruukki Coal-fired Power Station and associated infrastructure near Ogies, Mpumalanga Province

***Electricity Sector Projects: Wind Energy***

- Project manager for the EIA undertaken for the proposed EXXARO West Coast wind energy facility and associated infrastructure at a site within the Western Cape (for EXXARO Resources)
- Project manager for the EIA undertaken for the proposed Oyster Bay wind energy facility, Eastern Cape Province (for Renewable Energy Resources Southern Africa)
- Project manager for the EIA undertaken for the proposed Spitskop Bay wind energy facility, Eastern Cape Province (for Renewable Energy Resources Southern Africa)
- EIA and EMP for the proposed wind energy facility and associated infrastructure at a site within the Western Cape (for Eskom Generation)
- EIA and EMP for the proposed wind energy facility and associated infrastructure at a site near Hopefield, Western Cape Province (for Umoya Energy)
- Project manager for the proposed Klipheuwel/Dassiesfontein wind energy facility and associated infrastructure at a site within the Overberg area of the Western Cape (for BioTherm Energy)
- Project manager for the proposed Suurplaat wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)
- Project manager for the proposed West Coast One wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)
- Project manager for the proposed Rheboksfontein wind energy facility and associated infrastructure at a site within the Western Cape (for Moyeng Energy)

- Basic Assessment for proposed wind monitoring masts on a site north of Koekenaap, Western Cape Province (for EXXARO Resources)
- Basic Assessment for proposed wind monitoring masts on a site in the Overberg area, Western Cape Province (for BioTherm Energy)
- Basic Assessment for proposed wind monitoring masts on a site near Beaufort West, Western Cape Province (for Umoya Energy)
- Basic Assessment for proposed wind monitoring masts on a site near Laingsburg, Western Cape Province (for Umoya Energy)

***Electricity Sector Projects: Solar Energy***

- Project manager for the EIA and EMP for two PV sites within the Western and Northern Cape Provinces (for INCA Energy)
- Project manager for the Basic Assessment and EMP for PV site within the Northern Cape Province (for INCA Energy)
- Project manager for the Basic Assessment and EMP for a PV site near Rustenburg, North-West Province (for Momentous Energy)Project manager for the EIA and EMP for the proposed Project Ilanga (125MW CSP facility) near Upington, Northern Cape Province (for Ilangethu Energy)
- Project manager for the EIA and EMP for two PV sites within the Northern Cape Province (for MedEnergy Global)
- Project manager for the Basic Assessment and EMP for PV sites within 4 ACSA airports within South Africa (for ACSA PV)
- Project manager for the EIA and EMP for the proposed Waterberg PV plant, Limpopo Province (for Thupela Energy)

***Electricity Sector Projects: Eskom***

- Project manager for the EIA and EMP for the proposed Mokopane Integration Project, Limpopo Province (for Eskom Transmission)
- Project manager for the proposed transmission lines from the Koeberg-2 Nuclear Power Station site, Western Cape Province (for Eskom Transmission)
- Project manager for the proposed Tshwane strengthening project, Phase 1, Gauteng Province (for Eskom Transmission)
- Project manager for the EIA and EMP for the proposed Kyalami Strengthening Project, Gauteng Province (for Eskom Transmission)
- Project manager for the EIA and EMP for the proposed Steelpoort Integration Project, Limpopo Province (for Eskom Transmission)
- Project manager for the EIA and EMP for the proposed conversion of the existing Open Cycle Gas Turbine (OCGT) Ankerlig Power Station (located in Atlantis Industria) to a Combined Cycle Gas Turbine (CCGT) power station, and the associated 400 kV transmission power line between Ankerlig Power Station and the Omega Substation (for Eskom Generation)
- Project manager for the EIA and EMP for the proposed conversion of the existing Open Cycle Gas Turbine (OCGT) Gourikwa Power Station (located near Mossel Bay) to a Combined Cycle Gas Turbine (CCGT) power station, and the associated 400 kV transmission power line between Gourikwa Power Station and the Proteus Substation (for Eskom Generation)

***Strategic and Regional Assessments***

- Strategic Assessment for the location of wind energy facilities within the Western Cape Province (for Western Cape Department of Environmental Affairs and Development Planning)
- Regional Assessment for wind energy developments within an identified area on the West Coast of the Western Cape Province (for Investec Bank Limited)

- Regional Assessment for wind energy developments within an identified area on the West Coast of the Western Cape Province (for Eskom Holdings Limited)
- Regional Assessments for wind energy developments within identified areas in the Overberg Area of the Western Cape Province (for BioTherm Energy)
- Regional Assessment for wind energy developments within an identified area in the Sutherland Area of the Northern and Western Cape Province (for Investec Bank Limited)

***Environmental Management Tools***

- Review the effectiveness and efficiency of the environmental impact management (EIA) system in South Africa on behalf of the Department of Environmental Affairs and Tourism
- Development of a comprehensive site-specific EMP for the construction and operation of the Eskom Braamhoek Integration Project, Free State and KwaZulu-Natal Provinces
- Compilation of Provincial Guidelines for off-road routes within the Western Cape Province
- Environmental Risk Analysis for Salbro Property Holdings, Gauteng Province
- Water use permit applications for water use at Tiffindell Ski Resort, Eastern Cape Province
- Water use permit applications for various properties within the Olifants West Game Reserve, Limpopo Province
- Project integration and compilation of a Strategy for Sustainable Development for Gauteng Province
- Advice regarding environmental compliance of existing and future development at Tiffindell Ski, Eastern Cape Province
- Advice regarding environmental compliance at Salberg factory, Gauteng Province

***Peer Review***

- Review of EIAs submitted in terms of the ECA for the Northern Cape Department of Tourism, Environment and Conservation, including:
  - EIA for a new wastewater treatment works in Warrenton
  - EIA for chicken layer houses in Kimberley
  - EIAs for the upgrading of petrol stations in Kimberley
  - EIA for a new up-market residential development in Kathu
  - EIA for residential development in Kimberley
- Review of EIA and EMP for the proposed Waterfall Wedge development, Gauteng Province

***Infrastructure Projects***

- Project manager for the EIA and EMP for the proposed bridge across the Ngotwane River located on the border of South Africa and Botswana

***Mining Sector Projects***

- Amendment of Environmental Management Programme for the Waterberg Colliery near Lephalale, Limpopo Province
- Amendment of EMPR for Grootegeluk Coal Mine near Lephalale, Limpopo Province, to include coal transportation infrastructure between the mine and Medupi Power Station
- Environmental Impact Assessment and Environmental Management Programme in terms of the MPRDA for the proposed Elitheni Coal Mine near Indwe, Eastern Cape Province
- Environmental Management Programmes for three borrow pits associated with the proposed Groot Letaba River Development Project, Limpopo Province

***Water resources projects***

- Project manager for the EIA and EMP for the proposed modification of the existing Hartebeestfontein Water Care Works, Gauteng Province (for ERWAT)
- Project manager for the EIA and EMP for the proposed expansion of the existing Welgedacht Water Care Works, Gauteng Province (for ERWAT)

***<u>Projects undertaken on behalf of Bohlweki Environmental include:</u>***

***Specialist projects***

- Development of an Environmental Policy for the Ekurhuleni Metropolitan Municipality
- Development of an Integrated Environmental Policy for the City of Tshwane Metropolitan Municipality Environmental Opportunities and Constraints Assessment for the Wonderboom Airport

Review of the State of the Environment Report for the North West Province

***Transport sector projects***

- Environmental Impact Assessment for the proposed Platinum Highway from Warmbaths via Pretoria to Skilpadhek (on the South Africa-Botswana border), including obtaining all environmental permits required.
- Environmental input to the Ekurhuleni transportation corridors study
- Environmental input to the Denneboom Local Integrated Transport Plan
- Environmental Impact Assessment and Environmental Management Plan for the proposed N2 Wild Coast Toll Road between East London (Eastern Cape) and Durban (KwaZulu-Natal)
- Environmental Scoping Study and public participation process for the upgrading of Provincial Main Road 100 between the intersection with Main Road 521 and Ndwedwe
- Environmental Management Plan for repairs of portions of the N3 and N1, Gauteng
- Environmental Scoping Study and public participation process for the Kingsway Relief Road in Maseru, Lesotho

***Electricity Sector projects***

- Project manager for the undertaking of an EIA and compilation of an EMP for the proposed Open Cycle Gas Turbine (OCGT) Power Station and associated 400 kV Transmission lines and substation at Atlantis, Western Cape Province
- Environmental Scoping Study for a new coal-fired power station in the Lephalale area, Limpopo Province
- Project manager for the undertaking of Environmental Scoping Study and compilation of an Environmental Management Plan for various 132 kV Sub-Transmission lines and substations within the Mpumalanga Province
- Detailed Environmental Scoping Study and public participation for the proposed Capacity Increase Project at Arnot Power Station, Mpumalanga Province
- Project manager for the undertaking of an Environmental Scoping Study and EMP for the proposed 132 kV sub-Transmission line between the GaRankuwa and Dinaledi substations, North West Province
- Project manager for the undertaking of an EIA for the proposed 765 kV Transmission line between the existing Hydra Substation (near De Aar) and the proposed Gamma Substation (near Victoria West), Northern Cape Province
- EIA & public participation for the proposed 3$^{rd}$ 400 kV Transmission line between the Poseidon and Grassridge Substations in the Eastern Cape Province

- EIA & public participation for the proposed new 400 kV Transmission line between Matimba Substation (near Lephalale) and Witkop Substation (near Polokwane), Limpopo Province
- EIA & public participation for the proposed new Ikaros Substation and associated 400 kV Transmission line infrastructure, North West Province
- Environmental Scoping Study public participation for the Establishment of Eskom Infrastructure for Power Supply to the C-Cut Development at Premier Mine, Cullinan, Gauteng Province
- Environmental Impact Study and public participation for the proposed 2nd 400 kV Transmission line between the Grassridge Substation and the Poseidon Substation in the Eastern Cape.
- Public Participation Process for the proposed Return-to-Service of the Camden Power Station, Mpumalanga Province
- Detailed Environmental Scoping Study and public participation for the Breyten Strengthening Project: proposed new Breyten Substation and associated 88 kV Distribution line, Mpumalanga Province
- Environmental Pre-Scoping Study for the proposed Concentrating Solar Plant, in the Northern Cape Province
- Environmental Impact Assessment public participation for the proposed new nine 132 kV power lines between the Grassridge Substation and the Coega Industrial Development Zone, Eastern Cape Province

***Pipelines***

- Environmental Impact Assessment for the proposed Petronet New Multi-Products Pipeline (NMPP) between Durban and Gauteng Province
- Exemption application for the construction of a gas pipeline between Majuba Mine and Majuba Power Station, Mpumalanga Province.
- Exemption application for the construction of an emergency water supply pipeline from Mamelodi to Ekandustria via Cullinan, Gauteng Province.
- Environmental Scoping Study for the installation of a new water supply pipeline from Centurion to Diepsloot, Gauteng Province.

***EIAs for Technology projects***

- Environmental Impact Assessment for the proposed Alternative Fuels and Resources Project at Alpha's ULCO Plant near Kimberley in the Northern Cape Province
- Environmental Impact Assessment for the proposed Alternative Fuels and Resources Project at Dudfield Plant, North West Province
- Environmental Impact Assessment for the proposed Blending Platform to be established within the Gauteng Province
- Investigation of possible alternative Scrap tyre collection and disposal strategies in Gauteng, South Africa

***Mining sector projects***

- Environmental Management Programme Report (EMPR) for the proposed small-scale kaolin clay mine near Ndwedwe, KwaZulu-Natal Province
- Environmental Management Programme Report (EMPR) for prospecting activities within the Premier Mine Game Farm, Cullinan for De Beers Consolidated Mines Limited
- Environmental Management Plan for the Proposed C-Cut Development at Premier Mine, Cullinan
- Environmental Management Programme Report for the Proposed C-Cut Development at Premier Mine, Cullinan
- Environmental Impact Assessment and public participation process for the Proposed C-Cut Development at Premier Mine, Cullinan

***Development projects***

- A detailed Environmental Scoping Study and public participation process for the Thaba ya Batswana Development on portions of the Farm Rietvlei 101 IR, Gauteng
- Environmental Scoping Report and public participation process for the development of a Community Safety Centre in Khutsong-South, Carletonville

*Water resources projects*

- A detailed Environmental Impact Assessment of new regional water care infrastructure in the DD5A sub-drainage district in Eastern Gauteng (adjacent to the Blesbokspruit Ramsar Site) for the East Rand Water Care Company (ERWAT)

**CURRICULUM VITAE**
**TEBOGO MAPINGA**

| | | |
|---|---|---|
| Profession | : | Senior Environmental Consultant for Savannah Environmental Consultants |
| Specialisation | : | Environmental Management |
| Years of experience | : | 8 years |

**KEY RESPONSIBILITIES**

- Project Management and client liaison;
- Report writing and review;
- Compliance monitoring and audit reporting;
- Development of Proposals; and
- Staff monitoring.

**SKILLS BASE AND CORE COMPETENCIES**

- Report Writing, drafting proposals and tenders;
- Negotiating skill;
- Problem solving;
- Financial management and marketing;
- Understanding of all Environmental Legislation (NEMA, NEM:BA, NEM:WA, NEM:AQA, NEM:PAA, etc) and all other relevant legislation;
- Ability to work independently and in a team;
- Verbal, written and good presentation skills;
- Time management and workload management;
- Facilitation skills; and
- Organizational, planning and analytic skills.

**EDUCATION AND PROFESSIONAL STATUS**

***Degrees:***

- *Bsc Degree: The University of Limpopo, 2006; and*
- *Honours in Environmental Management: University of South Africa (in progress).*

***Courses:***

- Computer Literacy Course: University of Limpopo, 2005; and
- Environmental Impact Assessment Training: University of Pretoria, 2012.

***Professional Society Affiliations:***

- ***N/A***

**EMPLOYMENT HISTORY**

***Environmental Practitioner/ Project Manager: Phaki Phakanani Environmental Consultants (January 2007 - March 2008) Tasks include:***

- Training of junior staff;
- Client Liaison;

- Project co-ordination and facilitation;
- Managing specialists;
- Report writing and presentations;
- Compiling Environmental Impact Assessment Reports (Basic and Scoping/EIA Report); and
- Facilitating the Public Participation Process.

***Environmental Manager: SEF ( 1 April 2008 – 30 February 2009 ) Tasks include:***

- Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessments, Basic Assessments and Environmental management plans;
- Co-ordination of the public participation process;
- Project management, including specialists and other team members;
- Development of terms of reference, project proposals and tenders; and
- Client liaison.

***Environmental Project Manager: SEF (1 March 2009 until 31 April 2010) Tasks include:***

- Compilation of Environmental Scoping Reports, Plan of Study, Environmental Impact Assessments, Basic Assessments and Environmental management plans;
- Co-ordination of the public participation process;
- Project management, including specialists and other team members;
- Development of terms of reference, project proposals and tenders;
- Client liaison;
- Marketing; and
- Financial Management of projects.

***Environmental Officer Specialist production: Department of Environmental Affairs (1 April 2010 until 1 June 2013) Tasks include:***

- Process EIA applications submitted to DEA within the stipulated legislated time frames;
- Implement the SID and ERP EIA guideline;
- Provide technical input into Appeal Response Report's (ARR's);
- Support Regulatory Services with compliance monitoring and enforcement;
- Implement DEA and Public Entity EIA forums; and
- Provide technical input into CD: IEA correspondence.

***Environmental Scientist: GIBB Engineering and Science (Mega Projects) (1June 2013- 31 March 2014) Tasks include:***

- Re-writing the Revised Draft EIR Version 2 Eskom Nuclear-1 EIA; and
- Liaison with the client and specialists.

**PROJECT EXPERIENCE**

**ENVIRONMENTAL IMPACT ASSESSMENTS AND PUBLIC PARTICIPATION**

- Wesley Peddie Power Line Basic Assessment (2015)
- Pofadder Wind and Solar Energy Facilities (2014-2015);
- Pofadder Power Line Basic Assessment Application (2014-2015)
- Castle Wind Energy Facility (2014-2015)
- Spitskop Wind Energy Facility (2014-2015);
- Bobididi Solar Facility-Environmental Screening (2014);
- Son Sitrus Solar Energy Facility (2014);
- Nuclear- 1 EIA (2013);
- Langkuil Industrial Development, 2008 ( Environmental Manager and Project Manager);
- Township Development in Reitfontein, 2008/2009;
- Upgrading of the BP Golf Course, 2008;
- Construction of the BP Soshanguve VV Filling Station, 2008;
- Construction of the BP Soshanguve ZZ Filling Station, 2008;
- Shell Filling Stations( Project Manager and Client Liaison), 2008/ 2009:
- Watloo Filling Station
- Chantelle Filling Station
- M2 East Filling Station
- Orlando Filling Station
- Equestria Willowglen Filling Station
- President Park Filling Station
- Capital Park;
- Eskom- Komati Water Augmentation, 2008;
- Rainbow Junction Residential Development, 2008/ 2009;
- Township Development in Delmore Park Extension 7, 2008/ 2009;
- West Rand District Municipality- Bulk Water Supply 2009;
- West Rand District Municipality Air Quality Assessment;
- Lonmin K4 Shaft Mine Upgrading;
- Westlake Residential Development;
- Air Quality Management Plan;
- Montana Spruit Upgrading;
- Palm Ridge Township Development;
- HM Pitjie Roads;
- Vlaakplat S24G Application (Mokgale City Local Municipality);
- Rangeview Ext 2 S24G Application (Mogale City Local Municipality);
- Construction of Khetho Bridge, Greater Giyani Local Municipality, 2007;
- Demolition and Relocation of Malamulele High School, 2007;
- Construction of Malamulele Shopping Complex, 2007;
- The Subdivision of land in Ellisrus, 2007;
- Construction of the Senwabarwane Filling Station, 2007;

- Residential Development in Tlapeng Village, 2007;
- Township Development in Maphosa Village, 2007;
- Establishment of a Piggery in Mogalakwena Local Municipality, 2007;
- Establishment of two Piggeries in Elias Motsoaledi Local Municipality, 2007;
- Establishment of a Piggery in Modimolle Local Municipality, 2007;
- Township Development in Rietfontein, 2007;
- Public Participation and Section 24G Application for the National Taxi Scrapping Project, 2007;
- Construction of a Shopping Complex in Zebediela, 2007;
- Establishment of a Guest House (ECA application), 2008;
- Establishment of a Waste Management Depot in Rustenburg, 2008; and
- Establishment of a Waste Management Depot in Tzaneen and Nkowa-Nkowa, 2008.

**CURRICULUM VITAE**
**Gerhardus Alfred Botha**

| | | |
|---|---|---|
| Profession | : | Ecologist and Environmental Consultant |
| Specialisation | : | Ecological studies including flora, wetland and fauna studies |
| Years experience | : | 5 Years |

**KEY RESPONSIBILITIES**

Specific responsibilities as an Ecological Specialist and Environmental Consultant include, inter alia, professional execution of specialist consulting services (including flora, wetland and fauna studies, where required), impact assessment reporting, walk through surveys/ground-truthing to inform final design, compilation of management plans, compliance monitoring and audit reporting, in-house ecological awareness training to on-site personnel, and the development of project proposals for procuring new work/projects.

**SKILLS BASE AND CORE COMPETENCIES**

- Research Project Management
- Ecological assessments for developmental purposes (BAR, EIA)
- Working knowledge of environmental planning policies, regulatory frameworks and legislation
- Identification and assessment of potential environmental impacts and benefits.
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to execution
- Qualitative and Quantitative Research
- Experienced in field research and monitoring
- Working knowledge of GIS applications and analysis of satellite imagery data
- Completed projects in several Provinces of South Africa and include a number of projects located in sensitive and ecological unique regions.

**EDUCATION AND PROFESSIONAL STATUS**

***Degrees:***

- *2015:* Currently completing a M.Sc. degree in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- *2009:* B.Sc. Hons in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- *2008:* B.Sc. in Zoology and Botany, University of the Free State, University of the Free State, Bloemfontein, RSA.

***Courses:***

- *2013*: Wetland Management (ecology, hydrology, biodiversity and delineation) – University of the Free State accredited course
- *2014*: Introduction to GIS and GPS (Code: GISA 1500S) – University of the Free

State accredited course.

***Professional Society Affiliations:***

- The South African Council of Natural Scientific Professions: Pr. Sci. Nat. Reg. No. 400502/14 (Botany and Ecology).

**EMPLOYMENT HISTORY**

- *Current*: Ecologist, Savannah Environmental (Pty) Ltd
- *2013 – 2014*: Working as ecologist on a freelance basis, involved in part-time and contractual positions for the following companies
  - Enviroworks (Pty) Ltd
  - GreenMined (Pty) Ltd
  - Eco-Care Consultancy (Pty) Ltd
  - Enviro-Niche Consulting (Pty) Ltd
  - Savannah Environmental (Pty) Ltd
  - Esicongweni Environmental Services (EES) cc
- *2010 - 2012*: Enviroworks (Pty) Ltd

**PROJECT EXPERIENCE**

**ECOLOGICAL RELATED STUDIES AND SURVEYS**

- Barcelona 88/11kV substation and 88kV loop-in lines – Botanical Study (for Eskom).
- Farm development for academic purposes (Maluti FET College) on the Farm Rosedale 107, Harrismith – Ecological Study (for Agri Development Solutions).
- New boardwalk from Suiderstrand Gravel Road to Rasperpunt, Agulhas National Park – Botanical Survey (for SANPARKS).
- New boardwalk linking the southern most tip of Africa to the Cape Agulhas Lighthouse, Agulhas National Park – Botanical Survey (for SANPARKS)
- Construction of an icon at the southern most tip of Africa, Agulhas National Park – Botanical Survey (for SANPARKS).
- Optic Fibre Infrastructure Network, City of Cape Town Municipality – Assisted in botanical field work (for Dark Fibre Africa (Pty) Ltd).
- Optic Fibre Infrastructure Network, Swartland Municipality – Assisted in botanical field work (for Dark Fibre Africa).
- National long haul optic fibre infrastructure network project, Bloemfontein to Beaufort West – Protected and Endangered Species Walk Through Survey & Invasive Plant Management Plan (for NEOTEL Ltd).
- National long haul optic fibre infrastructure network project, Bloemfontein to Beaufort West – Vegetation Rehabilitation Plan for illegally cleared areas (for NEOTEL Ltd).
- Proposed establishment of the Tugela Ridge Eco Estate on the farm Kruisfontein, Bergville – Ecological Study (for Enviroworks (Pty) Ltd).
- De Aar Freight Transport Hub – Ecological Scoping and Feasibility Study (for Enviroworks (Pty) Ltd).

- Construction of Botshabelo 132 kV line – Ecological Study (for Enviroworks (Pty) Ltd).
- Establishment of Rocks Farm chicken broiler houses – Botanical study (for Rocks Farm (Pty) Ltd).
- Illegally ploughed land on the Farm Wolwekop 2353 – Vegetation Rehabilitation Study (for Enviroworks (Pty) Ltd).
- Proposed Gihon Solar Farm - Ecological Impact Assessment (for Savannah Environmental (Pty) Ltd).
- Proposed expansion of the existing Afrimat quarry near Hluhluwe – Botanical Study (for GreenMined (Pty) Ltd).
- Audit of protected *Acacia erioloba* trees within the Assmang Wrenchville housing development footprint area – Botanical Audit (for Eco-Care Consultancy (Pty) Ltd).
- Rehabilitation of the N1 National Road between Sydenham and Glen Lyon – Peer Review of Ecological Report (for EKO Environmental (Pty) Ltd)
- Rehabilitation of the N6 National Road between Onze Rust and Bloemfontein – Peer Review of Ecological Report (for EKO Environmental (Pty) Ltd)
- Proposed expansion of the existing Scottburgh quarry near Amandawe – Botanical Study (for GreenMined (Pty) Ltd).
- Steelpoort Integration Project & Steelpoort to Wolwekraal 400kV Power Line – Botanical Walk Through Survey (for Savannah Environmental (Pty) Ltd).
- Proposed Transalloys circulating fluidised bed power station near Emalahleni – Ecological Impacts Assessment (for Savannah Environmental (Pty) Ltd).
- Proposed Umbani circulating fluidised bed power station near Kriel – Scoping Ecological Impact Assessment & Ecological Impact Assessment (for Savannah Environmental (Pty) Ltd).
- Proposed Tshepong 5MW PV, Nyala 5MW and Eland 5MW facilities within Harmony Gold's mining rights areas between Odendaalsrus and Welkom – Ecological Impact Assessment (for Savannah Environmental (Pty) Ltd).

**ENVIRONMENTAL COMPLIANCE AUDITING AND ECO**

- National long haul optic fibre infrastructure network project, Bloemfontein to Laingsburg – ECO.
- National long haul optic fibre infrastructure network project, Wolmaransstad to Klerksdorp – ECO.
- Construction and refurbishment of the existing 66kV network between Ruigtevallei Substation and Reddersburg Substation – ECO.
- Construction and refurbishment of the Vredefort/Nooitgedacht 11kV power line – ECO
- Environmental compliance audit and botanical account of Afrisam's premises in Bloemfontein – Environmental Compliance Auditing.

**OTHER PROJECTS:**

- Keeping and breeding of lions (*Panthera leo*) on the farm Maxico 135, Ficksburg – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of lions (*Panthera leo*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of wild dogs (*Lycaon pictus*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Existing underground and aboveground fuel storage tanks, TWK AGRI: Pongola – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Erf 171, TWK AGRI: Amsterdam – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 14 000 L of fuel (diesel) aboveground on Erf 32, TWK AGRI: Carolina – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 23 000 L of fuel (diesel) above ground on Portion 10 of the Farm Oude Bosch, Humansdorp – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 16 000 L of fuel (diesel) aboveground at Panbult Depot – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks, TWK AGRI: Mechanisation and Engineering, Piet Retief – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Portion 38 of the Farm Lothair, TWK AGRI: Lothair – Environmental Management Plan (for TWK Agricultural Ltd).

# Curriculum Vitae of Celeste Booth

**Principal Human Scientist: Archaeologist**
**Department of Archaeology**
**Albany Museum**
**Somerset Street**
**Grahamstown**
**6139**
**Tel: 046 622 2312**
**Fax: 046 622 2398**
**Cell: 082 062 4655**
**Email: C.Booth@am.org.za**

**CURRICULUM VITAE**

**NAME:** Celeste Booth

**IDENTITY NUMBER:** 8001290110089

**DATE OF BIRTH:** 29 January 1980

**GENDER:** Female

**NATIONALITY:** South African

**CURRENT EMPLOYEMENT**:
Department of Archaeology
Albany Museum
Somerset Street
Grahamstown
6139
Tel.: 046 622 2312
Fax: 046 622 2398
Cell: 082 062 4655
Email: cbooth670@gmail.com

**COMPANY POSITION:**
Principle Human Scientist: Curator: Archaeologist, Head of Department: Department of Archaeology

**QUALIFICATIONS:**
**1997:** Matric Senior Certificate (Lawson Brown High School)
**2005:** Bachelor of Administration (Public Administration and Political Science as undergraduate majors)
University of Port Elizabeth/Nelson Mandela Metropolitan University
**2006:** Occasional Student for non-degree purposes focusing on the undergraduate Archaeology programme – completed the three years in one year.
University of Cape Town
**2007:** Bachelor of Science Honours (Archaeology)
University of Cape Town
**2013:** Continuing research for Master of Philosophy (Archaeology)
University of Cape Town

**MERITS AWARDED:**
**2004:** Golden Key Member
**2006:** Merit Award for Archaeology in Practice

**TERTIARY FIELD EXPERIENCE:**

**2006:**

1. Clanwilliam Field School:

Excavation of historical labourer's cottage at Warmhoek (Cedric Poggenpoel), rock

Art survey of areas in and around Clanwilliam (Tony Manhire).

2. Middle Stone Age (MSA) excavation at Diepkloof Rock Shelter (Pierre-Jean Texier & Jean-Philippe Rigaud)
3. Survey for signs of pastoralism along the Breede River, Swellendam (Charlie Arthur)

**2007:**

1. Excavation at Hoffman's / Robberg Cave, Robberg Peninsula, Plettenberg Bay (Catharine Kyriaku & Judy Sealy)

2. Middle Stone Age (MSA) Excavation at Diepkloof Rock Shelter (Pierre-Jean Texier)

**ARCHAEOLOGICAL RESEARCH EXPERIENCE:**

Trained in the Western Cape focusing on the west coast of the south-western Cape and six and a half years archaeological research in the Eastern Cape. This includes the fields of Middle Stone Age, Later Stone Age, the last 2 000 years and Rock Art.

**MEMBER OF:** Association of South African Professional Archaeologists (ASAPA)

**CONFERENCES ATTENDED:**

**2004:**

1. Anthropology of South Africa (ASA) Conference, Durban, South Africa.

Presentation: "Indigenous Knowledge and Sustainable Development in the 21st Century".

**2008:**

1. Association of South African Professional Archaeologists (ASAPA) Biennial Conference, Cape Town, South Africa.

**2009:**

1. South African Museum Association (SAMA) National Conference, Port Elizabeth, South Africa.

Joint Presentation (with Dr J.N.F. Binneman): "Heritage Management and Conservation".

**2011:**

1. South African Museum Association (SAMA) Eastern Cape Conference, Port Elizabeth, South Africa.

Presentation: "Respecting Human Remains in Removal, Research and Repatriation".

2. Association of South African Professional Archaeologists (ASAPA) Biennial Conference, Mbabane, Swaziland.

Presentation: "The Last 2000 Years of Diepkloof Rock Shelter, Verlorenvlei, South-Western Cape".

**2012:**

1. South African Museum Association (SAMA) National Conference, Paarl, South Africa.

Presentation: "The Evolving Heritage Sector and Adaptation for Success"

**2013:**

1. South African Museum Association (SAMA) Eastern Cape Conference, Port Alfred, Eastern Cape, South Africa.

Presentation: "The Evolving Heritage Sector and Adaptation for Success"

**WORKSHOPS ATTENDED**

**2008:**

**1.** Rock Art Management Workshop, Mapungubwe, Limpopo Province. Presented by the Getty Conservation Institute in collaboration with the South African Rock Art Project (SARAP), the South African National Parks (SANParks) and the South African Heritage Resources Agency (SAHRA).

**2009:**

**1.** Rock Art Conservation, Treatment and Interventions, Clanwilliam. Presented by the Getty Conservation Institute in collaboration with the South African Heritage Resources Agency (SAHRA), Living Landscape Project, the Rock Art Research Institute (RARI) and Cape Nature.

**2010:**

1. Ceramics in Archaeology. Presented by the Department of Anthropology and Archaeology, University of Pretoria, Pretoria.
2. Geographical Information Systems (GIS) in Archaeology. Presented by the School of Geography, Archaeology and Environmental Studies (GAES), University of the Witwatersrand, Johannesburg.

2012: The Association of Professional Archaeologists CRM Workshop, University of Cape Town.

**CULTURAL RESOURCE MANAGEMENT EXPERIENCE:** 6 years, 9 months

**CULTURAL RESOURCE MANAGEMENT PROJECTS – CLIENTS INCLUDE:**

AGES South Africa
Arcus Gibb Engineering and Science
Algoa Consulting Mining Engineers (ACME)
CEN Integrated Environmental Management Unit

Coastal and Environmental Services (CES)
Conservation Support Services
The Matrix cc
Amatola Quarry Products
Pro-Earth
Stellenryck Environmental Solutions
SRK Consulting
Terreco cc
Savannah Environmental (Pty) Ltd

**CULTURAL RESOURCE MANAGEMENT DESKTOP STUDIES AND ARCHAEOLOGICAL IMPACT ASSESSMENTS:**

**2008:**

Binneman, J.N.F. & Booth, C. 2008. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Granite Mine On The Farm Castleton No. 53, Komgha, Amathole District Council, Eastern Cape Province. Prepared for Terreco cc.

Binneman, J.N.F. & Booth, C. 2008. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Open Pit Mining Operation at Borrowpit 5, Kirkwood, Eastern Cape. Prepared For Terreco Cc.

Binneman, J.N.F. & Booth, C. 2008. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Open Pit Mining Operation at Borrowpit 3, On Farm 537, Kirkwood, Eastern Cape

Binneman, J.N.F. & Booth, C. 2008. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Limestone Mine on the Farm Patos Kop No. 219, Peddie District, Amathole District Municipality, Eastern Cape Province. Prepared for Imbewu Mineral Resources (Pty) Ltd.

Binneman, J.N.F. & Booth, C. 2008. A Phase 1 Archaeological Heritage Impact Assessment for the Proposed Construction and Operation of an Ethanol Production Plant on Erven 31, 32, 33 and the Remaining Extent Of Erf 1, Cradock, Inxuba Yethemba Local Municipality, Eastern Cape Province. Prepared for AGES South Africa.

Binneman, J.N.F. & Booth, C. 2008. A Phase 1 Archaeological Impact Assessment: The Proposed Kei Beach Hotel and Apartment Development, Erven 160, 161, 162 and 163, Kei River, Amathole District Municipality, Eastern Cape Province. Prepared for ARCUS GIBB ENGINEERING AND SCIENCE.

Binneman, J.N.F. & Booth, C. 2008. A Phase 1 Archaeological Heritage Impact Assessment of the Proposed Subdivision and Rezoning of Portions off

Garden Lot, Portion 20 of Farm No. 397 South Gorah, Kenton-On-Sea, Ndlambe Municipality, Eastern Cape. Prepared for Conservation Support Services.

Binneman, J.N.F. & Booth, C. 2008. A Phase 1 Archaeological Impact Assessment: South African Police Services (Saps) 10111 Call Centre, Erven 530 And 4162, Central Hill, Port Elizabeth, Eastern Cape Province. Prepared for the Matrix…cc Urban Designers and Architects on behalf of the Department of Public Works.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Mining of Granite on Farm 269, District East London, Buffalo City, Amathole District Municipality, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

**2009:**

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Granite Mine at Idutywa, Mazammisa Community Area, Mbashe Municipality, Amathole District Municipality, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Granite Mine at Idutywa, Colossa Community Area, Mbashe Municipality, Amathole District Municipality, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Dolerite Mine on Portions 3 And 61 of Farm No. 648, Wilsonia Industrial Area, East London, Amathole District Municipality, Eastern Cape Province. Prepared For Stellenryk Environmental Solutions Cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Sand Mine on Portion 1 (Lemoenfontein) of the Farm Die Woud No. 500, District Of Humansdorp, Eastern Cape Province. Prepared for Clean Stream Environmental Services: Coalfields Cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Sand Mine on Portion 20 of Farm Strandfontein No. 442, District Of Humansdorp, Eastern Cape Province. Prepared for Clean Stream Environmental Services: Coalfields cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage

Impact Assessment for the Proposed Weathered Dolerite (Sabunga) Mine on Portion 1 Of Farm No. 800, Gonubie, East London, Amathole District Municipality, Eastern Cape Province. Prepared For Veduba Investments Cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Weathered Dolerite (Sabungu) Mine On Portion 3 Farm No. 860, Mount Coke, East London, Amathole District Municipality, Eastern Cape Province. Prepared for Veduba Investments Cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Sand Mine on the Farm Happy Rest, Portion 1 of 696, Komgha, Amathole District, Eastern Cape Province. Prepared For Amatola Quarry Products Cc

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Granite Mine on the Farm Holme Park, Remainder 203, Komgha, Amathole District Council, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Clay Mine on the Farm Burnside, Kwelera, Buffalo City, Amathole District Municipality, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Hard Rock Quarry on Portion 14 of the Farm Waggie No. 110, Paterson, Sunday's River Valley Municipality, Alexandria District, Eastern Cape Province. Prepared for Arcus Gibb (Pty) Ltd.

Binneman, J.N.F. & Booth, C. 2009.A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Sand Quarry on Farm No's. 1323 and 1286, Kayser's Beach, Amathole District Municipality, Eastern Cape Province. Prepared for Stellenryck Environmental Solutions.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Mining of Gypsum on a Portion of Portion 1 (Thorndale) of the Farm East of Gous Kraal, No. 257, Division of Jansenville in the Magisterial Area of Ikwezi, Cacadu District of the Eastern Province. Prepared for Algoa Consulting Engineers cc.

Binneman, J.N.F. & Booth, C. 2009. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Heritage Impact Assessment for the Proposed Mining of Dolerite on Erf No. 702, Port St Johns District, O.R. Tambo District Municipality, Eastern Cape

Province. Prepared for Terreco cc.

Binneman, J.N.F. & Booth, C. 2009. A Phase 1 Archaeological Heritage Impact Assessment for the Proposed Subdivision And Rezoning of Erf 8517, Grahamstown, Makana Municipality, Cacadu District Municipality, for the Purposes of Constructing Residential And Town Housing, and Business Centre. Prepared for Conservation Support Services.

Binneman, J.N.F. & Booth, C. 2009. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Installation of A 132kv Electricity Supply Line, Bloemendal to Tembani T-Off, Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for SRK Consulting.

**2010:**

Binneman, J.N.F. & Booth, C. 2010. A Letter of Recommendation (with conditions) for the Exemption of a Full Phase 1 Archaeological Impact Assessment for the Proposed Opencast Clay Mine, Erf's 20 and 21 (Erf 561) of Wells Estate, Port Elizabeth, Nelson Mandela Metropolitan Municipality, Eastern Cape Province. Prepared for Algoa Consulting Mining Engineers Cc (Acme).

Binneman, J.N.F. & Booth, C. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Upgrading of the N2 Highway between Coega and Colchester as well as the Construction of the New Sundays River Bridge, and Four Borrow Pits, Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for SRK Consulting.

Binneman, J.N.F. & Booth, C. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Construction and Upgrading of the New Glenhurd Road as well as the Construction of the Baakens River Bridge, Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for CEN Integrated Environmental Management Unit.

Binneman, J.N.F. & Booth, C. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Motherwell NU 31 Housing Development, Portion 2 of 316, Uitenhage, Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for Arcus Gibb

Binneman, J.N.F. & Booth, C. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the proposed Rosedale Low Cost Housing project, Uitenhage, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Binneman, J.N.F. & Booth, C. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed 20mw Wind Farm on Three Alternative Sites: Erf 121, Driftsands (Site Alternative 1), Bushy Park Farm (Site Alternative 2) and Rietfontein Farm, Van Stadens East (Site Alternative 3), Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for SRK Consulting.

Binneman, J.N.F.; Booth, C. & Higgitt, N. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Dorper Wind Energy Facility on a Site

Near Molteno, Chris Hani District Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Binneman, J.N.F.; Booth, C. & Higgitt, N. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Sand Mining on the Elva Heights Farm 102 and on the Difusi Land Trust Property Incorporating the Farms De Bruyns Kraal, Doorn Kloof And Lang Vley, Paterson, Alexandria Municipality, Cacadu District, Eastern Cape Province. Prepared For SRK Consulting.

Binneman, J.N.F.; Booth, C. & Higgitt, N. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Coega Ridge Nu-Way Housing Development, Farms Welbadachtsfontein 300, Coega Kop 313, Coegas Kop 316, Coegas Kop 314, Nelson Mandela Metropolitan Municipality, Port Elizabeth, Eastern Cape Province. Prepared for SRK Consulting.

Binneman, J.N.F.; Booth, C. & Higgitt, N. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Skietkuil Quarries 1 and 2 on the Farm Skietkuil No. 3, Victoria West, Central Karoo District, Western Cape Province. Prepared for Acer (Africa) Environmental Management Consultants.

Binneman, J.N.F.; Booth, C. & Higgitt, N. 2010. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Riverbank Wind Energy Facility between Hamburg and Wesley, Amathole District Municipality, Eastern Cape Province. Prepared For Savannah Environmental (Pty) Ltd.

Booth, C. 2010. An Archaeological Desktop Study for the Proposed Riverbank Wind Energy Facility between Hamburg and Wesley, Peddie, Amathole District Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. & Higgitt, N. 2010. An Archaeological Desktop Study for the Proposed Karoo Renewable Energy Facility on a Site South of Victoria West, Northern and Western Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

**2011:**

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Binneman, J.N.F. & Booth, C& Higgitt, N. 2011. A Phase 1 Archaeological Impact Assessment for the Proposed Kentani-Qolorha River Mouth-Kei River Mouth Road Upgrade, Mnquma Local Municipality, Amathole District Municipality, Eastern Cape Province. Prepared For SRK Consulting.

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Binneman, J.N.F; Booth, C. & Higgitt, N. 2011. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Karoo Renewable Energy Facility on a Site South of Victoria West, Northern and Western Cape Province on the Farms Phaisantkraal 1, Modderfontein 228, Nobelsfontein 227, Annex Nobelsfontein 234, Ezelsfontein 235, and Rietkloofplaaten. Prepared for Savannah Environmental.

Booth, C. 2011. An Archaeological Desktop Study for the Proposed Establishment of the Spitskop Renewable Energy Facility and Associated Infrastructure on a Site North-West of Riebeek East, Cacadu District Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. 2011. An Archaeological Desktop Study for the Proposed 200MW Wind Energy Facility near Aberdeen, Camdeboo Local Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. 2011. An Archaeological Desktop Study for the Proposed Mainstream Aberdeen Wind Energy Facility, Aberdeen, Camdeboo Local Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. 2011. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Solar Facility on the Farm Toitdale, Portion 1 of 167, situated near Noupoort, Northern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

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Booth, C. 2011. A Phase 1 Archaeological Impact Assessment for the Proposed Cookhouse II Wind Energy Facility, Blue Crane Route Local Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

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**2012:**

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Booth, C. 2012. An Archaeological Desktop Study for the Proposed Elliot Wind Energy Facility on a Site West Of Elliot, Sakhisizwe Local Municipality. Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. 2012. A Phase 1 Archaeological Impact Assessment for the Proposed 75 MW Brakfontein Photovoltaic Solar Farm, Victoria West, Northern Cape Province. Prepared for SRK Consulting.

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Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of the Amandla Welanga Solar Energy Facility on the Remaining Extent of the Farm Rietfontein 140, near Noupoort, Northern Cape province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of the DIDA Solar Energy Facility on Portion 3 of the Farm Rietfontein 140, near Noupoort, Northern Cape province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of the Inkululeko Solar Energy Facility on Portion 2 of the Farm Carolus Poort 167, near Noupoort, Northern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment for Five proposed Borrow Pits, Whittlesea Area near Queenstown, Lukhanji Local Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed 75 MW Collett Photovoltaic Power Station and Associated Infrastructure at Collett Substation, On Farms 335/0 And Farm 180/0, Near Middleburg, Eastern Cape Province. Prepared for Centre for Environmental Management (CEM).

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment: Upgrade of N10 Section 3 from the Riet River (Km45.2) To Tarka Bridge (Km 68.5), near Cradock, Eastern Cape Province. Prepared for Coastal and Environmental Services (CES).

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment: Rehabilitation Of The National R61 Section 2 Elinus Farm (Km42.2) To N10 (Km85), Between Cradock and Graaff-Reinet, Eastern Cape Province. Prepared for Coastal and Environmental Services (CES).

Booth, C. & Sanker, S. 2012. An Archaeological Ground-Truthing Survey for the Proposed Power Line Corridor for the Metrowind Wind Energy Facility (WEF), Van Staden's, Nelson Mandela Metropolitan Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. & Sanker, S. 2012. A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of the Naaupoort Solar Energy Facility on the Remainder of the Farm Naauwpoort 1, near Noupoort, Umsobomvu Municipality, Northern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

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Booth, C. & Sanker, S. 2012. A Letter of Exemption to Conduct a Phase 1 Archaeological Impact Assessment as Part of the Environmental Assessment and Authorisation Process for the Proposed Mixed-Use Development on Part of R/Erf 361 And R/Erf 642 Adjacent to the Kowie River, Ndlambe Local Municipality, Port Alfred, Eastern Cape Province. Prepared for Bokamoso Landscape Architects & Environmental Consultants CC.

**2013:**

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment (AIA) for the Airports Company of South Africa (ACSA) proposed Port Elizabeth Airport Stormwater Upgrade, Walmer, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment for the Proposed Witteklip Waste Water Treatment Works and Connecting Sewer Line, Van Stadens, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Mining of Gypsum on Erasmuslaagte No. 13 in the Baviaans Local Municipality and Portion 1 of the Farm East of Gous Kraal No. 257 in the Ikwezi Local Municipality, Cacadu District Municipality, Eastern Cape Province. Prepared For Algoa Consulting Mining Engineers (ACME).

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment for the Proposed Establishment of a Camp Site for the Activities Associated With The Upgrade of the N10-4, Cradock [KM1.6] To Knutsford [KM29], Inxuba Yethemba Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Mining Right Application for The Mining of Dolomite, Limestone, Sand (General), Stone Aggregate, Gravel and Sand on Portions of Portion 17 and the Remainder of the Farm Lombard's Post 289, Bathurst, Eastern Cape Province. Prepared For Algoa Consulting Mining Engineers (ACME).

Booth, C. 2013. A Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Mining Permit Application on Erf 118, Schoenmakerskop, Port Elizabeth, Nelson Mandela Metropolitan Municipality, Eastern Cape Province. Prepared For Algoa Consulting Mining Engineers (ACME).

Booth, C. & Sanker, S. 2013. A Letter of Recommendation (With Conditions) for the Exemption of a Full Phase 1 Archaeological Impact Assessment for the Proposed Rehabilitation and Upgrade of the Cannonville Intersection off the N2 National Road and a Short Section of Road North of the N2, Colchester, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. & Sanker, S. 2013. A Letter of Recommendation (With Conditions) for the Exemption of a Full Phase 1 Archaeological Impact Assessment for the Proposed Bulk Sewer Pipeline for Kwanobuhle Extension 11, near Uitenhage, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. & Sanker, S. 2013. A Phase 1 Archaeological Impact Assessment for the Proposed 200MW Eskom Wind Energy Facility, Near Aberdeen, Camdeboo Local Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

Booth, C. & Sanker, S. 2013. A Phase 1 Archaeological Impact Assessment For The Proposed Spitskop Wind Energy Facility And Associated Infrastructure On A Site North-West Of Riebeeck East, Blue Crane Route Municipality And Makana Municipality, Eastern Cape Province. Prepared for Savannah Environmental (Pty) Ltd.

**2014:**

Booth, C. 2014. A Letter of Recommendation (With Conditions) for the Exemption of a Full Phase 1 Archaeological Impact Assessment for the Proposed Langbos Bulk Water Supply Service And Waste Water Service Pipelines,

Sunday's River Valley Municipality, Cacadu District Municipality, Eastern Cape Province. Prepared for SRK Consulting.

Booth, C. 2014. A Letter of Recommendation (With Conditions) for the Exemption Of a Phase 1 Archaeological Impact Assessment (AIA) for the Proposed Kwanonkqubela Alexandria Community Health Centre on Erf 623, Alexandria, Ndlambe Local Municipality, Eastern Cape Province. Prepared for CEN Integrated Environmental Management (IEM) Unit.

Booth, C. 2014. A Letter of Recommendation (With Conditions) for the Exemption of a Full Phase 1 Archaeological Impact Assessment for the Proposed Mining Permit Application on the Farm Altondale 408, Nelson Mandela Metropolitan Municipality (NMMM), Eastern Cape Province. Prepared for Algoa Consulting Mining Engineers (ACME).

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For A Mining Permit Application For Sand Mining On The Farm Tiger Springs 198, Near Bathurst, Amathole District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment For The Proposed Access Road Alternatives For The 75 Mw Brakpoort Photovoltaic Solar Farm, Victoria West, Northern Cape Province. Prepared For SRK Consulting.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For Two Additional Borrow Pits For The Upgrade Of The N2 National Route (N2-13) Between Grahamstown And The Fish River Bridge, Eastern Cape Province. Prepared For: Coastal And Environmental Services (CES).

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment (AIA) For The Proposed Clay Quarry On Portion 3 Of The Farm The Orchards 233, Division Of Grahamstown, Cacadu District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment (AIA) For The Proposed Sand Quarry On Portion 5 Of The Farm Lifford, District Of Albany Region, Cacadu District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For The Proposed Raymond Mhlaba Housing Development (Erf 50224, Erf 50226, And Subdivided Erven 45624 - 45627), Kwazakhele, Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared For Coastal And Environmental Services (CES).

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For The Proposed Masakhane Village Housing Project On Erf 8531 And Erf 52009,

Ibhayi, Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province. Prepared For Coastal And Environmental Services (CES).

Booth, C. 2014. Conservation Management Plan For The Mfengu Burial Site In Richmond Avenue, Richmond Hill, Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province. Compiled For Imbono FJA Architects Cc.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment (AIA) For The Proposed Road Upgrade Of The DR 08376 From The R61 At St Marks To Sabalele Village And Associated Borrow Pits, Near Cofimvaba, Intsika Yethu Local Municipality, Eastern Cape Province. Prepared For SRK Consulting.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For The Proposed Mining Of Sand On Portion 15 Of The Farm Lombard's Post 289, Southwell, Near Bathurst, Ndlambe Local Municipality, Sarah Baartman District Municipality, Eastern Cape Province. Prepared For Comply 360º Environmental Compliance Solutions.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment for the Proposed Spitskop East Wind Energy Facility Project, Cacadu District Municipality, Eastern Cape Province. Prepared For Savannah Environmental (Pty) Ltd.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For An Application To Mine Sand In A Section Of The Klein Fish River Situated On Portion 1 And Portion 8 Of The Farm Grootvlakte 49, Division Of Somerset East, Blue Crane Municipality, Cacadu District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For the Exemption of A Full Phase 1 Archaeological Impact Assessment for A Mining Permit Application to Mine Gravel / Stone on the Farm Olive Woods Estate 169, Division of Bedford, Amathole District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For A Mining Permit Application For A Hard Rock Quarry On The Farm Olive Woods Estate 169, Division Of Bedford, Cacadu District Municipality, Eastern Cape Province. Prepared For Stellenryck Environmental Solutions.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment (AIA) For The Proposed Walmer Gqebera Transitional Housing Development On A Portion Of Erf 1948, Walmer, Port Elizabeth, Nelson Mandela Metropolitan Municipality, Eastern Cape Province. Prepared For SRK Consulting.

Booth, C. 2014. A Phase 1 Archaeological Impact Assessment (AIA) For The Proposed Walmer Gqebera Low Cost Housing Development On Erf 11305, Walmer, Port Elizabeth, Nelson Mandela Metropolitan Municipality, Eastern Cape Province. Prepared For SRK Consulting.

Booth, C. 2014. A Letter Of Recommendation (With Conditions) For The Exemption Of A Full Phase 1 Archaeological Impact Assessment For The Proposed Upgrade Of The R335 Zuurberg Road, Km 90 To Km 163.70, Northern Section From Ann's Villa To Somerset East, Sunday's River Valley And Blue Crane Route Municipalities, Cacadu District Municipality, Eastern Cape Province. Prepared For Ethical Exchange Sustainability Services (Pty) Ltd.

**2015:**

Booth, C. 2015. A Phase 1 Archaeological Impact Assessment (AIA) For the Proposed Residential Development on Erf 181, Cape St Francis, Eastern Cape Province. Prepared For: Frank Silberbauer Consulting.

Booth, C. 2015. A Phase 1 Archaeological Impact Assessment (AIA) For the Proposed Residential Development on Erf 585, Cape St Francis, Eastern Cape Province. Prepared For: Frank Silberbauer Consulting.

# CURRICULUM VITAE

*Andrew Pearson*

*Ecology Specialist (Avifauna)*

*Email: AndrewP@arcusconsulting.co.za Tel: +27 (0) 21 412 1529*

**Specialisms**

- Avifauna Impact Assessment
- Environmental Management Processes
- Survey Design and Management

**Professional History**

**January 2014 to Present - Avifauna Specialist, Arcus Consultancy Services Ltd**

- Specialist Bird Impact Assessment Studies for energy infrastructure
- Design of high quality bird surveys in line with applicable guidance and legal requirements
- Design and implementation of operational carcass search programme including the training and management of locally based observers.
- Specialist raptor nest surveys

**March 2011 to December 2013 - Environmental Impact Assessment & Avifaunal Specialist, Endangered Wildlife Trust**

- Specialist Bird Impact Assessment Studies for energy infrastructure
- Extensive work in the Wind Energy Sector to reduce possible impacts on birds and bats
- 12 month Bird Monitoring on WEF sites: compilation of monitoring protocol; recruitment, management and co-ordination of observers; on site Bird observation as part of a 12 month monitoring programme; and compilation of final monitoring reports
- Presentations and Environmental Training

**January 2008 to March 2011 - Group Environmental Manager, Basil Read (Pty) Ltd**

- Environmental management of Roads and Civil construction projects.
- Implementation and certification of an ISO 14001:2004 Environmental Management System
- Group Internal Environmental Audits
- Compilation of EMP's and Environmental site inspections
- Assistance in ENV authorisations and applications
- Environmental Awareness Training
- Compilation of Group Carbon Footprint

**February 2006 to January 2008 - Game Ranger and Walking Guide, CC Africa (now *&BEYOND*), Phinda Private Game Reserve**

- Game drives and walks in a Big 5 reserve
- Hosting guests and sharing environmental and wildlife knowledge
- Environmental management, waste management

**Qualifications and Professional Interests**

- August 2010 - Hazard Identification and Risk Assessment (HIRA) Course, IRCA Global
- April 2010 - SAMTRAC, NOSA, East Rand Office
- April 2009 - Green Star Accredited Professional Exam, (GBCSA), PROMETRIC
- May 2008 - Environmental Auditing: ISO 14001:2004, a Lead Auditors Course (SAACTA approved), Centre for Environmental Management at North West University (NWU), Potchestroom
- February 2008 - Environmental Law for Managers, Centre for Environmental Management at NWU
- February 2008 - Implementing Environmental Management Systems-ISO 14001:2004, Centre for Environmental Management at NWU
- August 2007 - Bird Identification Course, Lawson's Birding Academy, 7 day intensive training in Makuleke, Kruger National Park, SA
- **2001 to 2005 - Bachelor of Science: Conservation Ecology, University of Stellenbosch**

# CURRICULUM VITAE

**Recent Conferences and Seminars**

- Windaba 2013 and 2014; Solar Indaba 2013
- IAIA SA National Conference 2013
- Endangered Wildlife Trust's Birds of Prey Programme (BoPP), Annual Conference 2012
- Power & Electricity World Africa 2012
- Wind Energy and Birds – Information Week. Endangered Wildlife Trust, 2011
- The South African Wind Energy association (SAWEA), inaugural Conference and Expo, "WINDABA", September 2011
- August 2011 IAIA South Africa, 2011 Conference
- March 2011 2011 Wildlife and Energy Symposium

**Additional Skills**

- ArcGIS, Google GEO tools and Google Earth
- Computer Skills: Office 2013 incl. Microsoft Word, Excel, Outlook and PowerPoint
- Field work skills involving various sampling methods, data capturing & analysis
- Excellent knowledge of fauna (especially birds) and flora
- 4x4 driving skills and PADI open water diver

**Project Experience**

- **Power-line Projects:**
  St Francis Bay Kouga 66kV; Ncwane Okuku 88kV; Vulcan Ekangala 132kV; Merapi Everest 400kV; Mathibestad Majaneng 132kV; Majaneng Themba Main-Babelegi 132kV; Ngoma Pandamatenga 400kV (ZIZABONA Phase 2); Estancia Thuli 132kV; Estancia Zamokuhle 132kV; Gumeni Bosloop 132kV; Mbumbu Tsakani 132kV; Normandie Heyshope 132kV; Mookodi Integration Project; Wildebees Bethal 132kV; Zaaifontein Mathondwane 88kV; Hlabisa Nongoma 88kV; Mandeni Gingindlovu 132kV; Tabor Nzhelele 400kV; Leksand St James 88kV; Emondlo St James 88kV; Randfontein Mine 132kV; Droogfontein CSP 132kV; Mtubatuba St Lucia 132kV; Ndumo Gezisa 132kV; Ermelo Uitkoms 88kV; TCTA Spring Grove 88kV; Springfontein 132kV.
- **Wind Energy Facility (WEF) Projects:**
  Kouga WEF; Aberdeen WEF; Hidden Valley WEF; Middleton WEF; Springfontein WEF, Moorreesburg WEF; Grassridge WEF; Ukomeleza WEF; Chaba WEF; Waainek WEF; Vryheid WEF; Kouga Western Cluster WEF; Hopefield WEF; DNA Elliot WEF; Confidential WEF near Elliot; Trouberg WEF; Umsinde Emoyeni WEF; Grassridge II WEF; Confidential WEF near Sutherland;
- **Concentrated Solar Power (CSP) Plants and Solar Photovoltaic (PV) Plants:**
  Humansrus 100MW CSP; Arriesfontein 100MW CSP; Arriesfontein 225MW PV; Eenzaamheid PV; Vaal Dam PV; Mokopole PV; Kalkaar CSP and PV; Droogfontein PV.
- **Other:**
  Expansion of Hendrina Power Station Ash Disposal Facilities; Expansion of Majuba Power Station Ash Disposal Facilities; Expansion of Tutuka Power Station Ash Disposal Facilities; Eskom Distribution Cedarville Upgrade; Eskom Limpopo Operating Unit (LOU) Head Office, Polokwane

**Affiliations**

- Member of the Birds and Renewable Energy Specialist Group (BARESG), South Africa
- South African Council for Natural Scientific Professions (SACNASP) Registration number 400423/11

**References**

- Jon Smallie- Wild Skies Consulting: 0824448919
- Sam Ralston- Birdlife SA: 083 673 3948
- Duncan Ayling – Renewable Energy Systems (RES) South Africa: 021 403 6385 / 079 498 4844