FINAL OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAM

FOR THE

GROMIS - ORANJEMUND TRANSMISSION LINE PROJECT

DECEMBER 2013
DEA REF No: 12/12/20/720

VOLUME I: MAIN REPORT & APPENDICES

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LIST OF ABBREVIATIONS

CE	Consulting Engineers
C	Contractor
CELO	Contractor Environmental Liaison Officer
CM	Contract Manager (Eskom)
NEMA	National Environmental Management Act (Dedicated Person)
EA	Environmental Authorisation
ECO	Environmental Control Officer
ELO	Environmental Liaison Officer
EMPR	Environmental Management Programme Report
OEMPR	Operation Environmental Management Programme Report
DEA	Department of Environmental Affairs
RoD	Record of Desicsion
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resource Agency
SAMOAC	South African Manual for Outdoor Advertising Control
SS	Site Supervisor

A. SECTION 1: GENERAL INFORMATION

1. Introduction

Baagi Environmental Consultancy CC, as Independent Environmental Consultant, was appointed by Eskom Holdings SOC Limited to facilitate and compile a site specific Operation Environmental Management Program for the approved Gromis-Oranjemund Transmission Power Line Project. Gromis-Oranjemund Transmission Line Project forms part of the Kudu Integration Network. The Record of Decision (RoD), pertaining to this project was issued under Reference number 12/12/20/720, "Proposed Kudu Integration Project, Northern Cape Province".

2. Background

It is widely accepted that any development can pose various risks to the environment as well as the inhabitants in the surrounding areas. These possible risks should be taken into account during operational phase of the development. The purpose of this document is to provide management responses that will ensure impacts resulting from the development are minimised. This EMPR is therefore a stand-alone document, which must be used onsite during operational phase of the development

This document should be flexible, so as to allow the contractor and Eskom Holdings SOC Limited to conform to the management commitments without being prescriptive. The management commitments should ensure that the anticipated risks on the environment will be minimised if they are consistently and effectively adhered to. The onus to undertake the requirements set out in the EMPR rests with Eskom Holdings SOC Limited, the main contractors and subcontractors, which will promote responsibility and commitment. Any party responsible for transgression of the underlying management measures outlined in this document will be held liable for non-compliances and will be dealt with accordingly.

Furthermore, this document is considered too dynamic and flexible. Therefore, this document can be amended with new issues, which arise during the entire operational period. The final EMPR will be submitted to the DEA for approval. In cases where there are significant changes to the EMPR, then the EMPR will need to be resubmitted to DEA for approval.

The process that was followed in compiling the EMPR is in compliance with Regulation 34 in terms of chapter 5 of the National Environmental Management Act (Act 107 of 1998) of New Environmental Impact Assessment Regulation, 2006 promulgated on the 21 April 2006. The purpose of this OEMPR is to formulate mitigation measures that should be made binding on all Eskom during the operational phase as well as measures that should be implemented during the operational phase.

3. Project Scope

The proposed project is a component of the Kudu Integration Project. It will entail the construction of a 400kV transmission power line from the Gromis-Oranjemund Substation. A favourable Record of Decision (RoD) was received from the National Department of Environmental Affairs and its reference number is 12/12/20/720. It must be clearly emphasised that this EMPR is not solely for all the agreed activities stipulated under positive environmental authorization received from DEA.

The operation of the project (reference number12/12/20/720) is being undertaken in phases; therefore, this EMPR is only relevant with regards to the proposed construction of a 400kV transmission power line from Gromis-Oranjemund, covering a distance of approximately 130km.

The final EMPR must be read in conjunction with the EIR associated with the RoD as well as the Draft EMP included in the EIR. All of these documents should be seen as one set and information should be assessed in conjunction will all the relevant documentation to ensure compliance and correctness. In compiling this EMPR the conditions of the RoD, the Final EIR and the Draft EMP were taken into account.

4. Terms of Reference of the OEMPR

As a condition of the RoD, an Environmental Management Programme (EMPR) must be compiled and approved by DEA, prior to the commencement of the operational activities for the proposed project. This document is also in accordance with the requirements stipulated in the Environmental Impact Assessment (EIA) Regulations of the National Environmental Management Act (NEMA). The regulations state that an Environmental Management Programme (EMPR) is to be implemented by the appointed contractor, which will ensure that environmental impacts that may occur due to activities are mitigated on site.

The EMPR will provide environmental management guidelines, which must be complied with by the contractor during construction of the power lines and associated pylons, in fulfilment of ISO 14001 requirements. The Environmental Control Officer (ECO), acting independently from Eskom Holdings SOC Limited, will monitor the implementation of the EMPR. The EMPR will form part of the contractual agreement to be entered into by Eskom Holdings SOC Limited and the appointed contractor. Compliance with the EMPR must therefore, form part of all contractor's working tender documentation and be endorsed contractually. The recommendations and constraints, as set out in this document are enforceable under the general conditions.

5. Objectives of the OEMPR

The objective of this OEMPR is to ensure that:

- This document aimed to provide a reference document that ensures that the environmental commitments, reporting, safeguards and mitigation measures and furthermore to ensure that all the project approvals, other relevant licences and permits are being implemented, monitored and reviewed.
- Environmental management conditions and requirements are implemented from the start of the project,
- The contractor is able to and shall include any costs of compliance with this EMPR into the tender document,
- Precautions against environmental damage and claims arising from such damage are taken timorously;
- The completion date of the contract is not delayed due to environmental problems with the landowner, grid staff, communities or regulatory authorities arising during the course of the project execution;
- The asset created conforms to environmental standard required by ISO 14001 and Transmission Policy;
- Eskom Project manager and Contractor take into consideration the landowner special conditions in regards to the power lines which transverses private property;
- Environmental conditions stipulated in the Environmental Authorisation (EA) are implemented;
- Resolve problems and claims arising from damaged immediately to ensure a smooth flow of operations;
- Implementation of this EMPR for the benefit of all involved; and
- Preservation of the natural environment by limiting destructive activities on site.

6. Limitations of the Study

The project initiation meeting held in July 2013 reached consensus amongst project managers and specialists that the study would be conducted over 8 days, visiting each pylon point and walking the areas between all the pylons. The specialists also determined areas to be visited for specific purposes outside of the walk down area. This was agreed to be the most effective way in which to do the study and would have enabled each specialist to walk to each and every pylon along the alignment.

There were no limitations, in accessing the different farms, as excess was granted to by the various landowners. Therefore both desktop and field studies were carried out and assessed. The outcome of the EMPR report is reliant on the findings of the specialist reports as per the relevant discipline.

7. Legal Framework

Depending on the type of development that is being proposed, certain legislation applies, either as a framework to guide the development process or as permit or approval requirements. This EMPR has been undertaken in accordance with provisions of the Environmental Authorisation issued by the DEA and in accordance with the provision of the Constitution and principles of Integrated Environmental Management.

All legislation applicable to the development must be strictly enforced both during the operational phase. The contractor must be acquainted with the relevant environmental legislation, including provincial and local government regulations, which are in place to ensure the protection of the environment. The environmental legislation applicable to the project includes, but is not limited to, the following:

- The Constitution of the Republic of South Africa, 1996;
- National Environmental management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Air Quality Management Act (Act No. 39 of 2004);
- National Water Act, 1998 (Act No. 36 of 1998);
- National Environmental Management: Biodiversity Act (Act 10 of 2004);
- Fencing Act(No. 31 of1963 (as amended by act 108 of 1991));
- Occupational Health and Safety Amendment Act (Act No. 181 of 1998);
- Hazardous Substances Act, 1973 (Act No. 15 of 1973);
- National Heritage Resource Act, 1999 (Act No. 25 0f 1999);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);

- National Environmental Management: Waste Act (Act No. 59 of 2008).

The Constitution of the Republic of South Africa

The Constitution of South Africa states that everyone has the right to an environment that is not harmful to his or her health or well-being and to have the environment protected for the benefit of present and future generations.

The Act implies that measures must be implemented to:

1. Prevent pollution and ecological degradation;
2. Promote conservation, and
3. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

The National Environmental Management Act

There are various elements within the National Environmental Management Act that are relevant to the operational phase of the Gromis-Oranjemund transmission power line. The 'polluter pays' concept is enforced to ensure that any party or parties, which undertakes any activity that may cause, causes or caused any pollution, must prevent, mitigate or remedy the effects.

Section 2 of Chapter 1 of the National Environmental Management provides details of the environmental management principles that should be adhere to during both the construction and operational phase of the development. The consideration of various factors must be brought into focus:

- Avoidance/minimisation of the loss of biodiversity,
- Avoidance/minimisation of the disturbance of ecosystems,
- Avoidance/minimisation of pollution,
- Avoidance/minimisation of cultural and heritage sites,
- Avoidance/minimisation/recycling of waste,
- Responsible and equitable use of renewable and non-renewable resources, and
- Avoidance/minimisation/mitigation of adverse impacts.

The National Environmental Management: Air Quality Act

The National Environmental Management: Air Quality Act (AQA) is the main legislative piece that controls air pollution within South Africa. The main objective of the AQA is to restore, protect and enhance the quality of air in South Africa, through sustainable development. The AQA aims to achieve these objectives through the establishment of norms and standards, and provide a regulatory framework for air quality management planning and reporting.

The National Water Act

The National Water Act (NWA) is the main legislative piece that controls both private and public water use within South Africa. According to section 19(1) of the National Water Act 'an owner of land, a person in control of land or a person who occupies or uses land on which any activity or process is or was performed or undertaken or any other situation exists, which causes, has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring.'

In accordance with Section 21 of the National Water Act the following are considered as water uses and therefore need to be licensed:

a) Taking water from a water resource.

b) Storing water.

c) Impending or diverting the flow of water in a watercourse.

d) Engaging in a stream flow reduction activity.

e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).

f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.

g) "Disposing of waste in a manner which may detrimentally impact on a water resource.

h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.

i) Altering the beds, banks, course or characteristics of a watercourse.

j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

k) Using water for recreational purposes.

National Environmental Management: Biodiversity Act

The Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was established. The Biodiversity Act further requires landowners to manage and conserve South Africa's biodiversity for current and future generations. The National Spatial Biodiversity Assessment classifies areas as worthy of protection based on their biophysical characteristics, which are ranked according to priority levels.

Fencing Act

The Act regulates matters with regard to boundary fences of farms and makes provisions for the erection, alteration, maintenance, damage and repair of. It also spells rights of owners or leaseholders where the land is subject to certain servitudes and outlines procedures for settling of

disputes due to wilful actions including leaving gates opened and unauthorised entry to private land.

Occupational Health and Safety Amendment Act

The Act makes provision for the health and safety of persons at work and persons that are not employees, against any hazards that may arise out of or in connection with the work related activities. The act has provisions regarding the maintenance and operation of plant and machinery, working conditions to the use of protective clothing and equipment. The Act therefore informs the EMP on measures and procedures to be incorporated regarding the safety and health of the persons on site.

Hazardous Substances Act

The main objectives of the Hazardous Substances Act is to provide measures, norms and standards for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure. The Hazardous Substances Act also aims to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.

The National Heritage Resources Act

The Act aims to promote an integrated system for the identification, assessment, and management of the heritage resources of South Africa. Section 35(4) of this above-mentioned Act states that no person may, without a permit issued by the responsible heritage resources authority; destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite.

This Act is concerned with the protection of the archaeological or paleontological sites or meteorites. Furthermore, Section 36(3) of the National Heritage Resources Act states that no person may, without a permit issued by the relevant heritage resources authority handle any human remains. Human remains can only be handled by a registered undertaker or an institution given the authority to do so under the Human Tissues Act (Act 65 of 1983 as amended).

Conservation of Agricultural Resources Act

The Act provides for control over the utilisation of the natural agricultural resources in the Republic of South Africa in order to promote the conservation of soil, the water resources, vegetation and the combating of weeds and invader plants.

The National Environmental Management: Waste Act

The National Environmental Management: Waste Act is the main legislative piece that aims to consolidate waste management within South Africa. Part 2 of the Waste Act details the general duty in respect to the management of waste by the holder of the waste. In accordance to Section 16(1) of the Waste act, 'a holder of waste must, within the holder's power, take all reasonable measures to:

a) avoid the generation of waste and where such generation cannot be avoided to minimise the toxicity and amounts of waste that are generated;

b) reduce, re-use, recycle and recover waste;

c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

e) prevent any employee or any person under his or her supervision from contravening this Act; and

f) prevent the waste from being used for an unauthorised purpose.'

8. Environmental Monitoring and Auditing

To measure and ensure compliance to this EMPR it is imperative that a monitoring and auditing programme be established, in which monthly reports are submitted to Eskom and DEA to indicate the level of compliance. In addition, potential risks to the project will have to be identified. Where the ECO identifies a transgression or blatant disregard to the EMPR it should be reported to Eskom immediately and rectification steps undertaken.

Bearing in mind that this document is a living document, it may be updated from time to time. The the proponent (Eskom) can make recommendations to the DEA for certain EMPR amendments. The proponent should then officially apply to DEA for the approval of the proposed amendments to the EMPR. The amended EMPR becomes valid once the authority (DEA) approves it in writing.

B. SECTION 2: SITE SPECIFIC ENVIRONMENTAL MANANGEMENT PROGRAM

1. Background

Environmental aspects that are generic and specific for the operational stages for the individual tower locations are identified and mitigation procedures are described.

During the construction phase and maintenance of the power lines, some habitat destruction and alteration inevitably takes place. Habitat destruction and alteration will result from the construction of access roads to the pylons, the removal of vegetation within the pylon footprints and the clearing of servitudes. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legal prescribed clearance gap between the ground and the conductors and to minimise the risk of fire under the line, which can result in the electrical flashover. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through habitat modification.

Whilst the indirect impact of the power line on avifauna through habitat destruction and disturbance can be mitigated by generic means, the impact of bird collision from the power lines is highly specialised and sites specific. Therefore, the impact of bird collision requires its own mitigation at each tower and span.

Where it is anticipated that ecological qualities of the landscape are going to be particularly altered by the various pylons, whether it to be the position or the result of erection and operational requirements, it is necessary to identify those locations and to describe what mitigations are required. In this way the specific ecological mitigation relates to an identified condition that will result in short term or long term ecological impacts. If this is not addressed in time and in a particular manner, persistent and irreversible long-term ecological impacts will result.

2. Technical Specifications

2.1. 400kV Transmission Power Line Specifications

The construction activities, with regards to the 400kV transmission lines, will not only include the stringing of the power lines, but also the erection of pylons and the clearing of vegetation for the pylons and the servitude roads. The technical details regarding the 400kV transmission power line are as follows:

- Single line servitude size is 55m;
- Towers are up to 42m in height;
- Distance between towers is between 350 and 500m, depending on terrain and route angles; and
- Minimum conductor clearance is 8.1m, above ground.

Tower design for the 400kV power lines are going to be the Guyed-V suspension and the Cross-Rope suspension as shown in **Figure 1** and **Figure 2**, whilst Self-supporting Strain towers and Self-supporting Suspension towers (refer to **Figure3**) will likely be utilised where difficult terrain is encountered or line deviations of more than 30° is unavoidable. The servitude width required for the construction of the 400kV power lines is 55 m, which means 55m for each respective 400kV power line.

The major construction activities that are generally associated with the construction phase of the loop-in and Loop-out transmission power lines include the following:

- Servitude gate installation to facilitate access to the construction site;

- Vegetation clearing to facilitate access, construction and the safe operation of the loop-in and loop-out lines;
- Pegging of tower positions for construction by the contractor;
- Transportation of equipment, materials and personnel to site and stores;
- Terracing of site;
- Installation of foundations for the towers;
- Tower assembly and erection;
- Conductor stringing and regulation;
- Taking over the line from the contractor for commissioning;
- Final inspection of the line, commissioning and hand over to the Grid Line and Servitude Manager for operation;
- Rehabilitation of disturbed areas;

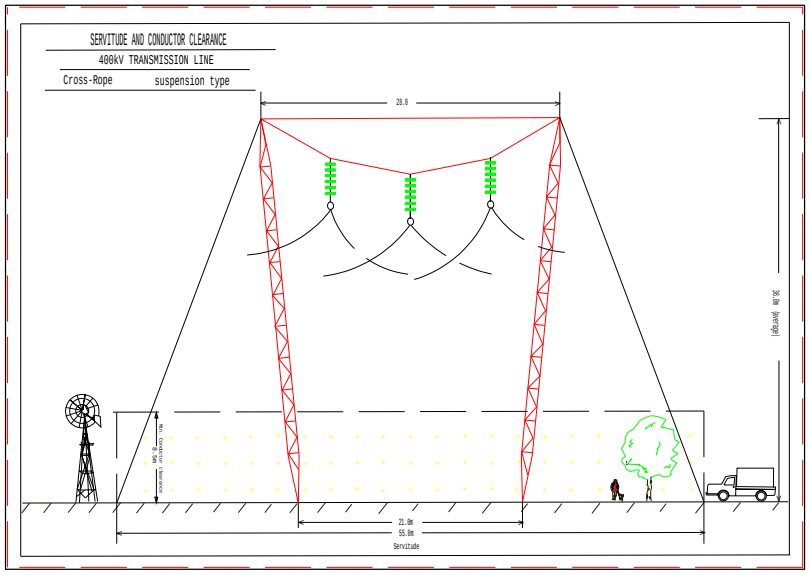

Figure 1: Cross-Rope Suspension Tower

Figure 2: Guyed-V Suspension Tower

Figure 3: Self-Supporting Strain Tower

3. *Environmental Matrix*

Function	Name / Cell No	Responsibility
Project Manager (PM) Eskom		Overall management of project and EMPR implementation
Site Supervisor/ Contract Manager (CM) Eskom		Oversees site works, liaison with Contractor, PM and ECO
Environmental Control Officer (ECO) Eskom		Implementation of EMPR and liaison between Eskom, Contractor and Landowners
Contractor (C)		Implementation and compliance with recommendations and conditions of the EMPR, Appoints dedicated person (CELO) to work with ECO
Contractor Environmental Liaison Officer (CELO)		Implementation of EMPR, landowner interaction, environmental control of site actions, re-mediation and rehabilitation work.
Group Capital Environmental Advisor (Eskom)		Environmental advice and auditing

The point of departure for this EMPR is to take a pro-active route by addressing potential problems before they occur. This should limit the corrective measures required during the construction and operational phases of the development. Additional mitigation will be included throughout the project's various phases, as required and if necessary.

4. Responsibility of the Role Players

- **Eskom Holdings SOC Limited**

The Eskom Team remains ultimately responsible for ensuring that the development is implemented according to the requirements of the EMPR. Although the Eskom Team appoints specific role players to perform functions on their behalf, this responsibility is delegated. The Eskom Team is responsible for ensuring that sufficient resources (time, financial, human, equipment, etc.) are available to the other role players (e.g. the ECO, CELO and contractor) to efficiently perform their tasks in terms of the EMPR. The Eskom Team is liable for restoring the environment in the event of negligence leading to damage to the environment.

The Eskom Team must ensure that the EMPR is included in the tender documentation so that the contractor who is appointed is bound to the conditions of the EMPR. The Eskom Team must appoint an independent Environmental Control Officer (ECO) during the construction phase to oversee all the environmental aspects relating to the development.

- **Contractor**

The contractor, as the Eskom's agent on site, is bound to the EMPR conditions through its contract with the Eskom Holdings SOC Limited, and is responsible for ensuring that it adheres to all the conditions of the EMPR. The contractor must be thoroughly familiarised with the EMPR requirements before coming onto site and must request clarification on any aspect of these documents, should they be unclear. The contractor must ensure they have provided sufficient budget for complying with all EMPR conditions at the tender stage.

The contractor must comply with all orders (whether verbal or written) given by the ECO, project manager or site engineer in terms of the EMPR.

- **Environmental Control Officer (ECO)**

The Environmental Control Officer (ECO) is appointed by the Eskom Holdings SOC Limited as an independent monitor of the implementation of the EMPR and monitor project compliance. The ECO must form part of the project team and be involved in all aspects of project planning that can influence environmental conditions on the site. The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMPR and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO is responsible for:

- Liaison with relevant authorities;
- Liaison with contractors regarding environmental management;
- Undertaking routine monitoring and indentifying a competent person/institution to be responsible for specialist monitoring, if necessary; and

- The ECO has the right to enter the site and undertake monitoring and auditing at any time, subject to compliance with health and safety requirements applicable to the site (e.g. wearing of safety boots and protective head gear).

The following responsibilities, as reflected in the original EA must be complied with:

- The ECO must be appointed before construction commences. It is advised that the appointment must be before the planning phase as the ECO will be required during this phase as well to ensure that the planned operation is in line with the RoD and EMPR;
- Monthly reporting to the DEA must include the following information:
  - Description of all activities on site;
  - Problem identified;
  - Transgressions noted; and
  - A task schedule of task undertaken by the ECO.
- ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation;
- The following will be maintained on site:
  - Records relating to monitoring and auditing must be kept on site and made available for inspection;
  - Site diary;
  - Copies of all monthly reports submitted to DEA;
  - Schedule of current activities on site as well as monitoring activities schedule; and
  - Compile a register of complaints by the public as well as the remedies applied to the complaints.
- All documentation, reports and notifications, required to be submitted to the department in terms of this authorization, must be submitted to the Director: Compliance Monitoring at the department.

An ECO must be contacted to oversee the project throughout, up to the completion of the rehabilitation on site and the site is then handed over to Eskom by all the contractors.

➢ Liaison with Authorities

The ECO will be responsible for liaising with the National Department of Environment (DEA). The ECO must submit monthly environmental reports. These environmental and audit reports must contain information on the contractor and Eskom's levels of compliance with the EMPR.

The audit report must also include a description of the general state of the site, with specific reference to non-compliance. The ECO is to recommend corrective action measures to eliminate the occurrence of the non-compliance incidents. In order to keep a record of any impacts, an Environmental Log Sheet (refer to **Appendix 1**) should be kept on a continual basis.

➢ Liaison with Contractors

The Eskom EO is responsible for informing the contractors of any decisions that are taken concerning environmental management during the operational phase. This would also include informing the contractors with the necessary corrective action to be taken.

▪ Contractor Environmental Liaison Officer (CELO)

The contractor must appoint an Environmental Liaison Officer (CELO) to assist with day-to-day monitoring of the construction activities. Any issues raised by the ECO will be routed to the CELO for the contractors' attention and subsequently, CELO liaise with the main contractor for his or her attention. The CELO shall be permanently on site during the construction phase to ensure daily environmental compliance with the EMPR and should ideally be a senior and respected member of the construction crew.

5. EMPR Approach

A project comprised of environmental consultants as a project manager and various specialists have contributed to the compilation of this EMPR. The specialists and their associate studies, which were undertaken to inform the EMPR, are listed in the table below.

Specialist	Organisation	Study/Function
Mr. Lordwick Makhura Ms. M Mabea	Baagi Environmental Consultancy CC	Project Manager Assistant Project Manager
Mr. Lukas Niemand	Pachnoda Consulting cc	Avifauna
Mr. Sam Laurence	Enviro-insight	Flora& Fauna
Mr. Nkosinathi Tomose	NGT Projects & Heritage Consultants (Pty) Ltd	Cultural & Heritage
Mr. Retief Grobler	Imperata Consulting	Surface Water & Wetland

Prior to a site visit of the proposed Gromis-Oranjemund transmission power line walk down process, the specialists were provided with the tower positions and coordinates in order to acquaint themselves with the area.

The site visit was undertaken from the 1STof November 2013 to the 8th of November 2013, by the following specialists:

- Avifauna
- Wetland;
- Cultural and Heritage; and
- Flora and Fauna (Ecological).

6. Description of the Affected Environmental Aspects

6.1. Flora Aspects

The proposed transmission line corresponds to the Desert (extreme north of the study site) and Succulent Karoo Biomes and more particularly to the Southern Namib, Namaqualand Sandveld and Richtersveld Bioregions as defined by Mucina& Rutherford (2006). It comprehends eight ecological types namely (1) Western Gariep Lowland Desert (2) Western Gariep Plains Desert, (3) Northern Richtersveld Yellow Duneveld, (4) Richtersveld Sandy Coastal Scorpiontailveld, (5) Southern Richtersveld Yellow Duneveld, (6) Richtersveld Coastal Duneveld, (7) Southern Richtersveld Inselberg Shrubland and (8) Namaqualand Strandveld

1. Western Gariep Lowland Desert – This vegetation type coincides with the extreme northern section of the proposed alignment. It consists of an extensive tilted plain of the Annisvlakte pediment along the lower reaches of the Orange River near Grootderm. It is predominantly characterised by a sparse low shrubland of leaf- and cushion-succulents such as *Ruschianthemumgigas* and *Brownanthus pseudoschlichtianus* with annuals such as *Mesembryanthemum hypertrophicum* and *M. squamulosum* being dominant on degraded areas. However, high loads of sand originating from the sandveld areas are transported in by frequent strong winds. Part of the unit is also characterised by rocks and shallow sand which provide habitat for the subterranean succulent *Fenestrariar hopalophylla* and a variety of species of *Sarcocaulon*.

The Western Gariep Lowland Desert is Least Concern and is poorly conserved in South Africa. However, it occurs partly in Namibia where it is conserved within the Sperrgebiet National Park. It is transformed by cultivation and heavily affected by livestock though part of it is has suffered damage from diamond mining. It is worth mentioning that this unit falls within the West Gariep Centre of floristic Endemism (Jürgens, 1991).

2. Western Gariep Plains Desert– This vegetation type is confined to northern section of the proposed power line and comprehends the plains east of Alexander Bay and south of Grootderm. It is typified by a sand movement corridor that is fed by material from the sandy beaches south of Cape Voltas. Although seemingly barren, it shows a floristic diversity and structure similar to the Western Gariep Lowland Desert. Due to frequent sand storms and high winds, the area is dominated by prominent psammophorous (sand-fixing) species (e.g. *Psammophora modesta* and *Chlorophytum viscosum*).

The Western Gariep Plains Desert is Least Concern and is poorly conserved in South Africa. However, it occurs partly in Namibia where it is conserved within the Sperrgebiet National Park. It is highly sensitive to mechanical disturbance to its soils and it should be treated as a highly sensitive system owing to a number of near-endemic species that is also shared with Namibia.

3. Northern Richtersveld Yellow Duneveld – This vegetation type is prominent on the study area north of the Holgat River and approximately 10 km inland from the coastline. The area is characterised by yellow sandy dunes with *Stoebe riautilis* on the dune tops and *Brownanthus pseudoschlichtianus, Cheiridopsisrobusta*and *Cephalophyllum ebracteatum* confined to the interdune valleys.

This unit is not threatened although none of it is currently statutory conserved. There are at present no major threats to the unit.

4. Richtersveld Sandy Coastal Scorpiontailveld– This vegetation type is confined to the central section of the proposed alignment. It is located south of Alexander Bay and north of Oograbies in a southerly direction between Port Nolloth and Kleinsee. The unit is defined by its dark soil composed of distinct soils with a biological surface crust and differs from other nearby vegetation types by its loamy soils and stable vegetation dominated by *Brownanthus pseudoschlichtianus, Stoebe riabeetzii, Othonnacylindrica, Lebeckia multiflora, Cephalophyllum ebracteatum* and *Phyllobolus decurvatus*.

This unit is not threatened although none of it is currently statutory conserved. There are at present no major threats to the unit.

5. Southern Richtersveld Yellow Duneveld – This vegetation type is prominent on the study area south of the Holgat River in the north to an area level with Port Nolloth in the south. The floristic composition and appearance of this unit mirrors that of the Northern Richtersveld Yellow Duneveld although it is denser and more species–rich due to high moisture levels.

This unit is not threatened although none of it is currently statutory conserved. Approximately 3 % of this unit is transformed by mining.

6. Richtersveld Coastal Duneveld – This vegetation type is highly localised and confined to a small area that overlaps with the Kamma River systems on the Kannikwa farm. This vegetation type occurs in a broad belt from an area in the north between the Boegoe Twins and Alexander Bay to an area in the south between Port Nolloth and Kleinzee. It is ascribed to a relatively homogenous vegetation cover wherever stable sand sheets occur of which the floristic structure is defined by soil depth and crust. Active dunes are often dominated by *Stoebe riautilis* which is replaced by *S. beetzii* on more stabilised sand sheets. The graminoid *Cladoraphis cyperoides* is prominent on areas of recent sand deflation.

This unit is not threatened although none of it is currently statutory conserved. Approximately 10 % of this unit is transformed by diamond mining.

7. Southern Richtersveld Inselberg Shrubland – This vegetation type is highly localised and confined to a small area north of Kleinsee along the seasonal Kwagga River system. This vegetation type is typical of the scattered inselbergs found between the Anenous Pass and Port

Nolloth and includes the mountains and ridges of Klaarkop, Kanies se Berg, Rooidam se Koppe, Steenbok se Berge and Beesvlei se Berg. The vegetation is highly variable and dependent on the size, aspect, rockiness and altitude of the inselbergs. However, the lower parts are often covered by sparse chamaophytes such as *Zygophyllum prismatocarpum*, while the higher altitudes are covered in dense dwarf leaf-succulents.

This unit is not threatened although none of it is currently statutory conserved. The inselbergs consists of a number of endemic taxa and should receive protection.

8. Namaqualand Strandveld – This vegetation type is prominent south of the Kamma River system (Kannikwa Farm) and north of Kleinsee (on the plains north of the Buffels River). This vegetation type is typical of the coastal peneplain and is specifically rich in plant species which is dominated by a variety of erect and creeping succulents (e.g. *Cephalophyllum, Didelta, Othonna* and *Zygophyllum*) and non-succulent species (e.g. *Eriocephalus, Lebeckia* and *Pteronia*).

This unit is not threatened although large parts are already lost due to coastal mining for heavy metals.

6.2. Tree Marking

The walk down involved a detailed vegetation assessment and the identification of protected trees in the proposed 400Kv power line corridor. During the walk down, no protected species were identified as candidates to be marked in accordance with the legislation. Therefore there are no figures to be submitted to the provincial government in order to apply for the necessary removal permits as per protected trees.

6.3. Fauna Aspects

From an overall faunal perspective, some of the habitat types within the corridor are considered to be sensitive on a large scale, as well as a site specific basis. Immediate impacts include trampling and overgrazing effects from livestock and wildlife mismanagement. Although a number of species in the area are considered to be red-data, the nature of the power line development is relatively low impact on most of the larger, more mobile species. It is the more sedentary and fossorial (burrowing) species, or those species relying upon sensitive habitats that may be at risk from the development process. Overall, from a terrestrial fauna perspective, power lines represent a relatively low impact development type. The linear footprint of the clearance will also be minimised as the existing servitude will be used to service the pylons, ensuring that that the overall habitat loss is diluted. However, recognised sensitive habitat such as ridges, dune crests or wetlands is at risk from impacts such as the creation of the small excavation paths, vegetation clearance by machinery and power line placement (and subsequent maintenance). There are two site specific habitats that must be identified as sensitive and may subsequently require site specific mitigation.

Seasonal pans and drainage lines

Seasonal pans are extremely important faunal habitats due to the limited surface area they encompass and the highly specific set of ecological conditions that they represent. ALL seasonal

pans must be avoided. There are a number of important taxa to consider in association with the pan and drainage systems.

- Amphibians and reptiles (herpetofauna): The seasonal pan systems provide breeding habitat for amphibians while drainage line systems provide movement corridors for herpetofaunal species.

- Terrestrial vertebrates: The seasonal pans provide drinking water for terrestrial species, whilst drainage line systems provide movement corridors for such species. Pan systems on the sodic areas are high in mineral salts, which meet the requirements for ungulate species.

Temitaria or heuweltjies

Temitaria habitats are extremely important for a number of reasons. Firstly, they represent highly specific micro habitats which provide both forage and refuge for many species of reptiles and small mammals. In addition, they are strongly linked with the aardvark *Orycteropusafer*, a highly important keystone species which create vital breeding and refugia habitat for a variety of species which are addressed below.

- Large and small carnivores: Large carnivores such as brown hyaena *Parahyaena brunnea* (IUCN near Threatened) as well as smaller carnivores such as honey badger *Mellivora capensis* (IUCN Near Threatened) make extensive use of temitaria for breeding and diurnal refugia. Other relevant species include black-backed jackal, African wildcat and caracal.

- Reptiles: Many reptile species reside in temitaria due to the fact that the internal cavities maintain a consistent temperature as well as providing refugia from predators. Some reptile species maybe temitaria obligates

Dune Crests

Fossorial species such as Namaqua Dune Mole-rat and Grant's Golden Moles: The most apparent faunal issue identified during the study was the periodic high densities of Grant's golden mole (*Erimital pagranti*) and Namaqua Dune Mole-rat (*Bathyergus janetta*) found along the proposed line. Grant's golden mole is listed by Friedmann & Daly (2004) as Vulnerable in South Africa while the Namaqua Dune Mole-rat is listed as Near Threatened (Figure 13 & 14). Current thinking regarding the Namaqua Dune Mole-rat is that its threatened status is as a result of its restricted distribution and not necessarily due to the impacts of mining and development in the region. The golden mole however is cause for large concern due to its restricted distribution and poorly understood biology. The species is a highly specialised and territorial mammal which prefers large sandy dunes, typical of much of the line. The reason for its vulnerability to the proposed development is two-fold. Firstly, Grant's golden mole has highly specialised middle ears, used for sensing vibrations and locating prey, thus rendering them susceptible to vibrations and

disturbances. Secondly, the species is highly territorial, meaning that areas exhibiting high densities at any given time are probably accurately representative of small scale populations, meaning that an area specific disturbance can have highly significant impacts on local populations. As a fossorial species residing beneath shrubs at no more than 50 cm beneath the ground (Figure 15), this species will be at risk from the proposed development and several mitigation measures (outlined below) are required in order to adequately manage the effects on the species.

In total, 34 pylons have been earmarked for mitigation representing 12.87% of the total pylon number. Mitigation measures primarily involve buffering of sensitive habitats (especially from operational related damage) as well as small scale relocation of pylon positions and erosion control. The decisions to mitigate have been made in anticipation of the subsequent construction activities and all pylon position relocation positions are seen as being non-sensitive. All recommendations, designed to mitigate the impacts of the construction process should be documented by the ECO and relayed to the constructor for implementation.

6.4. Avifauna Vegetation Aspects

The underlying geology is complex and primarily dominated by Quaternary sand and calcrete. Part of the central study area is underlain by quaternary sand and calcrete along alluvial plains. To the north (near the Oranjemund substation) the geology consists of schist, dolomite and andesite of the Oranjemund and Grootderm Suites (Namibian Erathem) with localised patches of gneiss, limestone and arenite pertaining to the Holgat River (the Holgat Suite) and quartzite, phyllite and diamictite of the Stinkfontein Formation (on the Farm Kwakanab).

Local Vegetation Description

The composition and distribution of the vegetation communities on the study area are a consequence of a combination of factors simulated by rainfall, soil depth, geology, animal activity (especially termite activity) and grazing disturbances. The major vegetation communities on the study area include the following:

(1) *Gariep gravel plains desert*- This community is confined to the northern part of the study area. The composition and structure of this woodland stand are influenced by frequent sand storms and high winds. Although seemingly barren, this community is typified by a species-rich composition pertaining to undulating gravel plains which support numerous dwarf succulents, many endemic to the Gariep Centre of Endemism (Van Wyk & Smith, 2001). Prominent species include *Cephalophyllum ebracteatum, Cheiridopsis cf. brownii, Brownanthus pseudoschlichtianus, Euphorbia ramiglans, Ruschianthem umgigas, Sarcocaulon multifidum, S. flavescens, Didelta cf. carnosa, Zygophyllum clavatum, Pteronia glabrata* and *Stipagrostis geminifolia*.

Helme (2006) makes mention of at least ten highly localised species endemic to the area during an earlier assessment of the route, in particular *Neopatersonia falcata, Massoniasessiliflora, Juttadinteriadeserticola, Fenestrariar hopalophylla, Pelargonium*

sibthorpii folium, Euphorbia ramiglans, Sarcocaulon patersonii, Ferraria schaeferi and *Othonna furcata.*

This particular community should be regarded as one of the most sensitive floristic communities on the study area due to its exceptional high levels of floristic endemism. It should be noted that this community provides habitat for the near-endemic Barlow's Lark (*Calendulauda barlowi*) including a localised stronghold population of the "vulnerable" and power-line sensitive Ludwig's Bustard (*Neotis ludwigii*).

(2) *Richtersveld yellow to red duneveld* - This composition is prominent on the sandy dunes of the study area and is dominated by tall *Euphorbia mauritanica, E. dregeana, Stoebe riabeetzii, Brownanthus pseudoschlichtianus* and O*thonna cylindrica* restricted to the dune crests. Smaller dwarf succulents and low shrubs such as *Cephalophyllum ebracteatum, Dideltacarnosa, Grielumhumifusum, Zygophyllum morgsana, Lebeckia cf. cinerea, Lampranthussua vissimus* and *Trachyan drafalcata* are typical on interdune areas. Active dunes and high dunes subjected to high wind loads are earmarked by a high prominence of graminoid taxa such as *Cladoraphis cyperoides*. The composition is seasonally augmented by a variety of annual Asteraceae such as *Dimorphotheca pluvialis*, *D. sinuata* and *Heliophila* spp.

From an avifaunal perspective, this habitat is regionally prominent and provides habitat for the "intermediateform" of Barlow's Lark (*Calendulauda barlowi*) where it comes geographically into contact with the Karoo Lark (*Calendulauda albescens*), especially north of the Holgat River. In addition, the sandy substrate is utilised by the "vulnerable" Grant's Golden Mole (*Eremitalpagranti*).

It is worth mentioning that this community between Kleinsee and the Kwagga River (corresponding to the regional vegetation type Namaqualand Strandveld) appears to be in better condition (based on the high apparent richness and prominence of primary graminoids such as *Stipagrostis ciliata*) than those occurring further north due to pro-active management of livestock (owing to rotational grazing). This particular area supports a large number of Ludwig's Bustards during the austral winter.

(3) Richtersveld "heuweltjieveld" on slightly undulating plains – This composition is prominent on the central part of the route alignment and floristically synonymous to the Richtersveld Sandy Coastal Scorpiontailveld as defined by Mucina and Rutherford (2006). A prominent feature of this community is the humped appearance of the landscape due to the occurrence of ancient disused termitaria (that was formed by former *Microhodoterm esviator* activity). These represent slightly elevated mounds that are easily recognisable by their different colour and floristic composition. These mounds are characterised by a central hardpan which are virtually absent on base-poor parent material (see Mucina& Rutherford, 2006). Owing to the fertile soils, being nutrient-rich, associated with these mounds and a high pH, these are invariably colonised by highly palatable plant species which are therefore also intensively grazed by livestock.

Typical plant species associated with the "heuweltjies" include *Mesembryanthem umbarklyi, M. pallidum*, *Stoebe riabeetzii* and *Cephalophyllum ebracteatum.*

The "heuweltjies" provide a firm substrate for burrowing mammal taxa which is often invaded by large colonies of Brant's Whistling Rats (*Parotomys brantsii*).

(4) *Isolated patches of quartz and calcrete plains* - The distribution of calcrete and quartz plains are highly localised and confined to an area near Witbank north of the Holgat River (pylons 218-221), the Holgat River valley itself (pylons 179-180), the Kwagga River valley on the Farms Kwakanab and KareedoornVlei (pylons 40 – 34) and isolated plains between pylons 160 - 162. These areas are characterised by the prominent formation of a surface layer of small quartz and calcrete gravel or stones (known as a white desert pavement). These gravel plains function as a protective mulch that enhance water infiltration and solar heat reflectance which has contributed to increased local plant species and generic endemism. These desert pavements are covered in dwarf succulents with a high proportion comprising of rare and localised species pertaining to the Mesembryanthemaceae (see Helme, 2006). Typical genera include *Cheiridopsis, Fenestraria, Conophytum* including dwarf species of the Crassulaceae.

Habitat types and their avifaunal importance

Bird diversity is positively correlated with vegetation structure although floristic richness is not regarded to be the most important contributor of observed patterns in bird abundance and spatial distributions. In this particular scenario, the Desert and Succulent Karoo are generally poor in woody and graminoid plant species although it is considered to be an important habitat for many terrestrial bird species such as larks, bustards, chats and cisticolas. Many of these species are in fact endemic to the region (e.g. Barlow's Lark *Calendulauda barlowi*) and even threatened (e.g. Ludwig's Bustard *Neotis ludwigii*). On the other hand, mesic woodlands on the eastern parts of the country are rich in woody plant species and are an important constituent of the Savanna Biome that provides habitat for a large number of bushveld species that are not partial to Desert and Succulent Karoo.

Although the bird diversity on the abovementioned vegetation units is not comparable to that of richness observed from the mesic woodland and grassland on the eastern parts of South Africa, it does harbour a high number of species that are either restricted in range or endemic to the region. Many of the species that occur on the study area show high affinities to the Nama-Karoo with two species restricted to the Karoo-Namib zone: Barlow's Lark (*Calendulauda barlowi*) and Tractrac Chat (*Cercomelatractrac*). Dominant passerines include members of the Alaudidae(Karoo Lark *Calendulauda albescens*, Large-billed Lark *Galeridam agnirostris*, Cape Long-billed Lark *Certhilaudacurvirostris* and Grey-backed Sparrowlark *Eremopterix verticalis*), Cisticolidae (Grey-backed Cisticola *Cisticolas ubruficapilla*, Rufous-eared Warbler *Malcorus pectoralis* and Karoo Prinia *Prinia maculosa*), Muscicapidae (Karoo Chat *Cercomela schlegelii*, Sickle-winged Chat *Cercomelasinuata* and Karoo Scrub-robin *Cercotrichascoryphoeus*)and the Fringillidae (Yellow Canary *Serinusflaviventris*).

Non-passerines were mainly dominated by the corvids (Pied Crow *Corvusalbus* and Cape Crow *Corvus capensis*) and accipitrine and faconiform raptors (e.g. Greater Kestrel *Falco rupicoloides* and Southern Pale Chanting Goshawks *Melierax canorus*). These species often make use of the existing 275 kV pylons as nesting platforms.

In addition, a number of azonal habitat units were also identified in the study area, and it was necessary to elaborate on their importance from an avifaunal perspective:

- *Seasonal drainage lines*– These include a number of ill-defined and highly seasonal streams and rivers (e.g. the Holgat, Kamma and Kwagga systems). These linear systems facilitate bird dispersal, thereby linking the study area with other important foraging areas located within the Orange River catchment. The seasonal drainage lines are often covered in dense shrub which provide additional refuge and foraging habitat for the smaller passerine bird species;
- *Ephemeral depressions* – these represent small albeit scattered ephemeral depressions. When inundated they benefit the colonisation and range expansion of certain waterbird species that favours open water habitat (e.g. South African Shellduck *Tadornacana*);
- *Old sheep troughs and reservoirs*– These were thinly scattered along the alignment and comprised of open trampled vegetation. These areas could be utilised by birds of prey species (e.g. Martial Eagle *Polemaetus bellicosus* and Southern Pale Chanting Goshawks *Melierax canorus*) when engaged in activities such as bathing or drinking;
- *Holgat River gorge*– The Holgat River forms a deeply incised and ancient rocky gorge with areas consisting of steep vertical cliffs which provide ideal nesting and hunting habitat for a range of birds of prey species. Typical species associated with the Holgat River gorge include the Peregrine Falcon (*Falco peregrinus*), Rock Kestrel (*Falco rupicolis*), Booted Eagle (*Aquila pennatus*) and the Jackal Buzzard (*Buteoru fofuscus*).

6.5. Heritage and Cultural Aspects

Namaqualand has long history and prehistory. The earliest known hominids in southern Africa are the *Australopithecus africanus* (Clarke &Kaman, 1999:6). These hominids roamed many parts of the Sub-Saharan regions including the Northern Cape. Some of the regions are suggested to have been covered in thick vegetation before the encroachment of the many deserts we see today. Earliest known sites to contain hominids fossils remains include those located in the COHWH (Cradle of Humankind World Heritage Site). The Sterkfontein Caves present one of the best known fossil hominid site and amongst the most studied in southern Africa. It is also one of the hominid sites will known cave infill's dates - which took place around 3,5 to 3,0 million years ago and they are preserved in the geological Members 2 to 5 (Clarke & Kuman, 1999:6). Hominid fossils have also been discovered in areas such as Taung. The famous Taung Skull, an infant ape-man skull, discovered by Prof. Raymond Dart in 1924, following the lime mining activities of a tufa deposit at Buxton Lime works (*Clarke pers.com, 2013*). Other fossil remains known hominids remains were discovered later such as the *Australopithecus africanus* first discovered in 1936 (on the 17th of August) by Dr Robert Broom who was then working as a palaeontologist for the Transvaal Museum. In subsequent years many hominid fossils have been discovered in what has been declared (by UNESCO in 1999) as the COHWHS. These include the 1997 discovery of the almost complete skeleton of *Australopithecus* (Clarke 2008). However, this does not mean that hominid remains were restricted within the Gauteng, Northern Cape and North West Provinces of which all have sites that are linked to the Cradle of Humankind. For example, we know that there are many Early Stone Age industries found spread across the Northern Cape, the Free State and the Western and Eastern Cape Provinces. In the Northern Cape some of the earliest known ESA industry is the Victoria West Stone Industry which also spreads to the Free State Province, but is dominant in the Northern Cape. The earliest industry known to occur in this region includes the Victoria West Stone Industry which was first recorded and defined by R. A., Smith in 1915 and in the Free State region along the Vaal River basin. Associated with this industry included Handaxe and what Smith refers to as '*Tortoise Cores'* (Smith, 1920). The "*Tortoise Cores*" are most probably Smith's reference to the peculiar feature or morphology of *Prepared Cores* – where different pieces are chipped off from a single piece of parent material to make way for the ultimate removal or shaping of a specific tool and most likely a well-defined hand axe. A. H. J., Goodwin (1935) defines the Victoria West Industry as an industry that is with and without cores. Meaning that Handaxe and cleavers could have been produced without necessarily having to prepare a parent material to a point to which a single definable tool could be produced. The absence of prepared cores in relation to hand axes and cleaver did not mean the end to this stone tool manufacturing techniques for it becomes a dominant and defining feature towards the end of the ESA into the MSA (Middle Stone Age). What first became known as '*Tortoise Cores'* was later defined as the transition marker between the ESA and the MSA. Therefore, the *Prepared Cored* of the Victoria West industry can be taken as the markers of transitional period in the Stone Age industry from Acheulian into the MSA, a second clearly defined phase in Stone Age technological innovation. Lycett (2009) sees the Victoria West as an evolutionary step towards the *Levallois Prepared Core Technique* which signifies the outwards spread of the Stone Age technology. Stone artefacts dated to the above ESA industries are commonly found in open sites as secondary occurrences and/or scatters and not within their primary context.

This Stone Age industry is succeeded by the Middle Stone Age. During the MSA smaller and sizeable stone artefacts replace the dominant large and often imposing Handaxe and Cleavers that characterise the ESA. This transition in archaeological records is dated between 300 and 250k.y.aup to 30 k.y.a. During this period, smaller artefacts defined the archaeological records and the most dominant ones are flake and blade industry. As such, this technological period has been defined by some in 'archaeological circles' as a period that signifies a secondary step towards the modern human behaviour through technology, physical appearance, art and symbolism (e.g. Binneman*et al*. 2011).This innovation is suggested to have been at its most probable peak during the last 120 k.y.a. With surface scatters of the flake and blade industries found throughout the southern Africa regions (e.g. Thompson &Maream, 2008). They often occur between surface and approximately 50-80cm below ground. At times, in some sites, fossil bones are found in association with the MSA stone artefacts. The flakes and blade industries are often found in secondary context as surface scatters and occurrence like their predecessor industries. Malan (1949) defines the earliest MSA stone industry as the Mangosia and its distribution stretching across the Northern Cape, the Griqualand in Northern Cape, Natal, and the Cape Point as well as the Free State Province. The Prepared Core Technique which had become the defining technological technique of the MSA is in this industry replaced by the Micro Lithics that become a dominant feature or trait in the LSA (Late Stone Age). In the Northern Cape Province artefacts associated with the Mangosia industry are known to have been made from indurate shale raw material (Binneman*et al*. 2011). They mostly occur as surface scatter. The MSA tools include flakes, blades and points. Their time sequence is often not known because they mostly occur in surface. Other industries within the MSA include:

- The Howieson'sPoort which is known to have wide distribution throughout southern African including the Northern Cape Province.
- The Orangia 128 to 75 k.y.a.
- Florisbad and Zeekoegat industries dated between 64 and 32 k.y.a -Florisbad is dominant in the Free State Province but also found in the Northern Cape.

Most of the MSA stone artefacts are made from the following materials: fine grain quartzite, quartz, silcrete, chalcedony and hornfels (Binneman*et al*. 2011, see also Binneman*et al*. 2010a). Like the ESA artefacts, the MSA stone artefacts occur in secondary context owing to a variety of reasons. One is due to natural events and/or activities such as erosion and being wash down by water and riverine activities, animal and human disturbances and so forth. Succeeding this industry is the Late Stone Age.

The southern Africa LSA is known to span a period from 30 k.y.a to the historical time i.e. the last 500 years to 100 years ago (e.g. Mitchell & Whitelaw, 2000). It is associated in archaeological records with the San hunter-gathers (ibid). This is particular important for the last 10 k.y.a whereby the San material culture dominate the archaeological records -mostly in rock shelters, caves as well as open air sites in both the interior and coastal regions (ibid). However, the San open air sites are not always easy to find because they are in most cases covered by the various forms and types of vegetation and the other contributing factor is the mobility nature of these people. They were not sedentary people like their Iron Age counter parts who needed to settle the land for ploughing and long term seasonal grazing periods etc. In the coastal regions, sand

dunes sometimes become impediments in locating LSA sites. Owning to all these factors the preservation state of the LSA archaeology is often poor and not easily disenables (Deacon & Deacon 1999). Caves and rock shelters provide a more substantial preservation record of pre-colonial record of indigenous people's archaeology. This is in form of stone artefacts, rock art and other material culture such as beads etc. It has recently emerged that the LSA archaeology was not solely dominated by the San hunter-gathers particularly in the last half -in some 2 k.y.a the southern Africa landscape was penetrated by the Khoekhoe pastoralist introducing sheep, cattle and goal along with them (e.g. Hall & Smith, 2000; Sadr). Ceramic vessels are some of the material culture that signifies the Khoekhoe material culture in archaeological records – including the depiction of sheep and cattle often found in San hunter-gather rock art (ibid). Smith and Hall (2000) give detailed descriptions of potential relations that could have taken place between the San, the Khoekhoe and the Iron Age farmers. They also argue that the material culture of the Khoekhoe herders included among other things the art of making rock art. Binneman (*et al*. 2011) suggests that the diet of this new group of people would have also included muscle collected along the muddy river banks, coastal line and riverine and terrestrial foods. Other than the material culture such as artefacts found within the LSA industries, burials or human remains become dominant in the landscape. In the coast they are often found buried underneath middens (dumpsites)(e.g. Deacon & Deacon 1999). While in the interior regions they are sporadic and can occur across various features in the landscape. The Nama people associated with the Namaqualand region of the Northern Cape have been linked by some to Khoekhoe while some refer to them as the Hottentots. They first arrived in the region around 2000yearsago, when the Khoekhoe, or Nama, arrived from the area that now encompasses northern Botswana (Kostka, 2000s). On their arrived the Nama people introduced means of wealth and power in form of domestic livestock, mostly goats and cattle. Until now their descendants in the Richtersveld move their livestock in seasonal patterns, always following the fresh growth in different areas after the autumn rainfalls (*ibid*).

The LSA archaeology is therefore rich and varied consisting of stone artefacts, other forms of material cultures such as beads (ostrich egg shell beads are dominant), pottery, rock art in form of paintings and engravings with engraving dominating the central low land interior regions but also found elsewhere. The Northern Cape Province is known for some of its splendid rock art sites in predominantly in form of engravings, which in a way make it distinct from other South African rock art regions. Paintings are also found in this region -for example, Ouzman defines Korana rock art in the region (2005). Among some of the well known engraving sites in this province are Wildebeest Kuil and DriekopEiland near Kimberly. In the composition of stone artefacts, bifaces still continue and are supplemented by tangled barbed arrow heads made from the various materials found with the southern Africa regions. Humphrey (1969) defines the dark or black fine grained chalcedony as the most preferred form of material in the Karoo (Northern Cape regions), the Free State Province and Lesotho for stone tools.

Smithfield settlement sites are concentrated among hills and ridges in preference to flat and mountains. Smithfield was divided into three phases using scrapper size and shape (Goodwin & Van Riet Lowe 1929).

- Smithfield A – large scrappers
- Smithfield B – long and narrow scrappers
- Smithfield C – small thumbnail scrappers.

As a result of the various groups known to have existed hand by hand during the LSA up-to the historic period in the last 500 years ago – we get multiple layers of material culture and artefacts associated with the LSA. For example, archaeologists talk of burials, the art and symbolism (rock paintings and engravings), beads, stone artefacts or tools, bones associated with the material culture in rock shelters and caves etc. As the result the region has been divided into five geographic regions according to its distinctive landscape and climatic conditions. From the south to the north is the Knersvlakte with its broad flatplains; in the central region Hardeveld comprising granite hills and the vast sandy expanse of the Sandveld along the coast; the high mountains of the Kamiesberg region; and the Richtersveld with its mountain deserts and arid plains. This has also influenced the recent occupation of the Namaqualand. What is in the name Namaqualand?

The name 'Namaqua' is a plural term for the indigenous Nama people who occupied this part of the world before the arrival of the settlers in the 1800s. The majority of these people are now settled in Namibia, the former South-West Africa which was once administered by the Republic of South African Government during the Union and the Apartheid political landscapes. The Namaqualand as a cultural and natural geography is a diverse and big region. In contextualising our study area – it is within the western boundary approximately 14km from the ocean (*Figure 2*). A coast known to many as the coast of diamonds, a name associated with the establishment of the mining town of Alexandra Bay - located approximately 2.4km south of the Orange River mouth and 15.3km from Oranjemund Substation. The western coast of South Africa up to Namibia is also known as the ship wreck coast owing to the number of ship wrecks along the coastal shore. Some of the ship accidents resulted from the rough ocean currents and winds associated with the Atlantic Ocean. An ocean where the South Atlantic anticyclone system gives rise to Benguela Current that brings Antantic waters into contact with the littoral and rise to the south -easterly trade winds.

The combination of the cold current, from which there is minimal evaporation, and a hot offshore wind that has lost most of its humidity causes the region arid climate. This would have also influence the occupation of this region in the prehistoric times during the time of the Nama people who are now mostly concentrated in Namaland in Namibia. What is most significant about the evolution of this landscape from human geography perspective is its association with the mining history dating as far back as the prehistoric times. The Nama people are known to have exploited copper in the region during the prehistoric time until they introduced it to white people at the Cape during the governorship of Simon van de Stel. Van de Stel later investigated the Copper Mountain near Springbok in1685 but deemed it to be inaccessible to exploit and it was not until 1852 that the rich deposits of copper were first mined at Springbok a town located approximately 250 or more kilometres east of the project area. However, copper deposits were not the only resources exploited in this region; by far the most valuable Namaqualand natural resources are diamonds. Not much is recorded about the first discoveries at the mount of the Orange River between 1925 and 1926. The significant discoveries of diamond mining are

associated with Dr Hans Merensky, a geologist by profession, diamondiferous fossil deposits in 1927. His findings were worth about £150000 within six weeks and this resulted in the Great Namaqualand diamond rush. To prevent the collapse of the diamond market the, the government had to regulate the industry and it did this by closing all other claims leaving Dr Merensky claims who by subsequently sold the nation which resulted in state diggings at Alexandra Bay. Diamonds were later discovered Kleinsee near the mouth of Buffels River soon after the Alexandra bay Discovery. The Cape Coast Exploration Company opened up the Kleinsee crater from which the first haul yielded £120 000 worth of gems which was just below the Alexandra Bay discovery. Now restricted mining at Kleinsee is conducted by the Consolidated Diamond Mines under the control of De Beers Consolidated Mines. The diamondiferous area is about 50km long and averaging about 10km wide from Kleinsee to Port Nolloth is a prohibited area (*Figure 12*). As a result of this town such as Alexandra Bay are restricted from the general public. Located between the town of Kleinsee and Alexandra Bay is the town of Port Nolloth. Port Nolloth is located west of the proposed power line. The town is itself named after Commander M. S. Nolloth RN who surveyed the Namaqualand coast in the HMS Frolic in 1854 (*Figure 13*). Initially a harbour, Port Nolloth lost much of its importance when the transport of copper ore by road to the railhead at Bitterfontein replaced the rail transport to the coast. As a result this small town later became a centre for catching and processing lobster. However, diamond proclamation boats are still seen along Port Nolloth harbour. To support the growing mining industry such as copper mines in the Springbok area and the diamond mines along the coast infrastructure would have needed to be set up. This would have included roads and rails but most importantly water resources as this is an arid region with only 250mm annual rainfall. As one travels along the road between Springbok and Port Nolloth the remains of old reservoir tanks and water pump stations are seen along the road sides.

In conclusion the area between Kleinsee, Port Nolloth and Alexandra Bay has experience enormous amounts of disturbance from mining related activities to supporting industries such as the construction of roads, railway line and Eskom Powerline among other industries. The area in which our study is located has a significant history and heritage dating as far back to the Stone Age, Iron Age (copper mining) to much recent industries and settlement.

6.6. Wetlands and Surface water course

In terms of the Ramsar Convention on Wetlands (Iran 1971), to which South Africa is a contracting party, "… wetlands include a wide variety of habitats such as marshes, peatlands, floodplains, rivers and lakes, and coastal areas such as salt marshes, mangroves, and sea grass beds, but also coral reefs and other marine areas no deeper than six metres at low tide, as well as human-made wetlands such as waste-water treatment ponds and reservoirs" (Ramsar Convention Secretariat 2007).

In South Africa, wetlands are defined as "…land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil" (National Water Act, Act No. 36 of 1998), (NWA). Wetlands are also included in the definition of a watercourse within the NWA, which implies that whatever legislation refers to watercourses will also be applicable to wetlands. The types of features included within the definition of a watercourse include:

- "…a river or spring…"
- "…a natural channel in which water flows regularly or intermittently…"
- "…a wetland, lake or dam into which, or from which, water flows…"
- "…any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse…"

In addition, the NWA stipulates that "…reference to a watercourse includes, where relevant, its bed and banks…" This has important implications for the management of watercourses and encroachment on their boundaries, as discussed further on in this document.

The NWA defines riparian areas as "…the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas…" Note that this does not imply that the plant species within a riparian zone must be aquatic, only that the species composition of plant assemblages must be different within the riparian area and adjacent uplands.

In terms of the latest wetland delineation document available from the Department of Water Affairs and Forestry (DWAF), now known as the Department of Water and Environmental Affairs (DWEA), "wetlands must have one of the following attributes" (DWAF 2005):

- **Wetland (hydromorphic)** soils that display characteristics resulting from prolonged saturation.
- The presence, at least occasionally, of **wetland associated plants (hydrophytes)**.
- A high **water table** that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

It follows that the level of confidence associated with a specific area being considered as a wetland is proportionate to the number of confirmed indicators that positively correlate with wetland habitat. Not all indicators are always present within a specific biophysical and land use setting, while not all indicators are always reliable and/or useful under all conditions. The use of additional wetness indicators from different disciplines that are internationally applied therefore adds value and confidence in the identification and delineation of wetland habitats, especially in challenging environments (Illgner et al., 2009).

7. Method Statement

A Contractor shall submit a written method statement to the ECO for review and recommendations, covering these activities, which are identified (in this document and/or by the ECO), as being potential harmful to the environment. Method statements indicate how compliance with the Environmental Specification will be achieved. The approval of the method statements will be undertaken by both the ECO and Eskom.

The Method Statement shall state clearly:

- Timing of activities;
- Materials to be used;
- Equipment and staffing requirements;
- Proposed operation procedure designed to implement the relevant environmental specifications;
- The system to be implemented to ensure compliance with the above; and
- Other information deemed necessary by the ECO.

The method statement shall be submitted at least 14 working days prior to projected commencement of work on an activity, to allow the ECO time to review and provide recommendations on the method statement. The Contractor shall not commence work on that activity until such time as the method statement has been approved in writing by ECO, which shall be done within seven working days of receipt.

Due to changing circumstances, it may be necessary to modify method statements. In such cases, the proposed modifications must be indicated and agreed upon in writing between Eskom, the ECO and the Contractor.

The ECO and SS must retain records of any amendments and ensure that the most current version of any method statement is being used.

The following are typical Method Statement's which will be called for by the ECO:

- Location, layout and preparation of the construction camp(s) and materials storage areas;
- Location, layout and preparation of cement/concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water from such areas;
- Contaminated water management Program, including the containment of runoff and polluted water;
- Emergency construction Method Statements (including details of methods for fuel spills and clean up operations);
- Rehabilitation of disturbed areas and re-vegetation after construction is complete;
- Solid waste management and removal of waste from site; and
- Crossing of erosion trenches and drainage lines
- Vegetation Clearing

The specific activities for which a method statement is required is indicated in the Table below, under general environmental specifications for the construction of the development by the following asterisk (**√**). Please note that wherever the √ appears, the Contractor shall submit a method statement. Additional method statements may be required by the ECO during the course of works, depending on the nature of the operational works and the location thereof. The SS and ECO shall approve any deviation from a method statement. The examples of how method statement should be prepared by contractor for different activities are found in **Appendix 6**. All the activities listed under **Appendix 6** as an example for method statement, a contractor shall be required to prepare method statement for each of the activities to be subjected to approval by ECO.

8. Generic Mitigation Measures

These measures must be read with the original EMP complied during the Environmental Impact Assessment for which the Record of Decision has been issued (refer to **Appendix 5)**. The ECO must utilise this final CEMP in conjunction with the original Draft EMP.

Operation Phase	Environmental Issue	Mitigation Requirements
1. Rehabilitation	• Damaged sensitive areas	All areas indicated as sensitive which has been damaged during the construction phase must be rehabilitated as per the approved rehabilitation method statement.
2. Maintenance of avifaunal mitigation aspects	• Bird interactions with the power lines may occur during the operational phase, such as collisions, nests, bird related faulting	Eskom's standard line monitoring will be sufficient to detect any problems and allow evaluation of the success of mitigation measures. Servitudes should be monitored for erosion and degradation of sensitive and wetland areas. Any areas indicating degradation from the baseline information in the EIR and this EMPR or erosion areas must be rehabilitated.
3. Maintenance of ecological mitigation aspects	• Increase in weeds and invader species, erosion of the maintenance road • Management and maintenance of erosion area	1. Pylons and servitudes should be monitored for the sprouting and establishment of declared weeds and invaders, especially in areas that have been disturbed during the construction phase.
4. Invasive alien plant species	• Introduction and spread of invasive alien plant species • Introduction and spread of invasive alien plant species, especially in wetland zones	1. Eradicate all declared alien invasive plant species through use of a specialist group, such as Working for Water, if possible. The eradication of alien invasive plant species should be undertaken at the discretion of Eskom. Eradication of alien plants should occur in all areas disturbed by the construction activities.
5. Maintenance of heritage/archaeological mitigation aspect	• Looting of sites by maintenance teams	1. Access to cultural and heritage sensitive sites must be denied to maintenance teams. 2. No collection of artefacts on any site.
6. Monitoring of collisions	• bird mortalities due to power line collisions	1. It is strongly advised that the alignments be patrolled by Grid when possible after commencement of the operational phase to quantify bird mortalities of

Operation Phase	Environmental Issue	Mitigation Requirements
		species and numbers involved in collisions (counting of carcasses or signs of carcasses). 2. The data should be stored at the electrical infrastructure mortality incident register of EWT

8. General Environmental Specifications for the Operation Phase

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
• **Site Monitoring, Auditing and Reporting**			
❖ The ECO / CECO shall remain employed until all rehabilitation measures are completed and the site is handed over to Eskom by the contractor for operation.	PM, Eskom	Continuous	
❖ Fourteen (14) days written notice must be given to the Department prior to operation commencing. Commencement for the purposes of this condition includes site preparation. The notice must include the anticipated date on which the activity will commence.	PM, Eskom	Prior to construction	
❖ Records and documents as indicated below must be kept on site in accordance with the standard Eskom site documentation policy. The documentation shall be signed by all parties to indicate acceptance and understanding. **The following documentation shall be kept on site:** 1. Access negotiations and physical access Program; 2. Complaints register; 3. Site daily dairy; 4. Records of all remediation / rehabilitation activities; 5. Copies of two-weekly reports to the Tx Services Environmental Advisor; 6. Copy of the Construction Environmental Management Program; 7. Environmental Incident Log; 8. ECO inspection audit reports; 9. The record of decision issued for the project. 10. Copies of all permits and licenses, and 11. HIRSA	Contractor CELO	Continuous	
❖ All records relating to monitoring and auditing must be made available for inspection to any relevant authority, or Eskom's Environmental Audit Team (Tx service Environmental Advisor), in respect of the development. Monthly reports of the ECO must be submitted to all relevant authorities.	Contractor CELO	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ DEA reserves the right to monitor and audit the development throughout its full life cycle to ensure compliance with the RoD as well as mitigation measures in the final EIR report and this EMPR.	Contractor CELO	As necessary	
❖ No work shall commence until permission is granted from the Environmental Advisor from Transmission Services and acceptance of this EMP from DEA has been obtained.	PM	Once-off	
❖ All contact with landowner shall always be courteous at all times and a record of all conversations must be kept. ❖ The rights of landowners shall be respected at all times and all staff shall be sensitized to the fact that they are working on the private property. ❖ The contact numbers of the contractor's, ECO officer and the Eskom project manager shall be made available to the landowner as this will ensure open channels of communication and prompt response to queries and claims.	ECO CELO	As necessary	
Management objectives		**Measurable targets**	
▸ Maintain good relationship with Landowners. ▸ Maintain accurate records in order to prove compliance to the EMPR and Eskom 's commitment to fulfil these requirements		▸ **No delays in the project due to Landowner interference** ▸ **Landowner signs final release form.**	
▪ **Environmental Induction Training**			
❖ An initial environmental awareness training session is required prior to any work commencing.	CELO	When new staff are contracted and before the start of construction and if required follow up after environmental impact incidence, outside of the EMPR or EIA occurred	
❖ The contractor must ensure that all site staff are aware of, and understand the contents and condition of EMPR, the key environmental issues and the consequences of non-compliance.	Contractor C	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
❖ The ECO will assist the contractor with the course content for the environmental awareness-training course, and the contractor shall communicate this information to his employees on the site, to any new employees coming onto the site, to his subcontractor, casual labourers and to the suppliers.	Contractor ECO	As necessary	
❖ All site staff must attend induction training on the EMPR and records must be kept of all attendees. • Induction training must be undertaken in a language that is understood by site staff and must include the following topics: • Key potential or actual environmental operational related impacts on site related environmental precautions, which need to be taken to avoid or mitigate these impacts; • Key mitigation measures to be implemented during operational activities; • Emergency responses to issues on site; • Roles and responsibilities of all staff on site; and • The benefits of achieving conformance with, and consequences of transgressions of environmental specifications or requirements of the EMPR.	Contractor ECO	As necessary	
▪ **Planning and Site Preparation**			
❖ All work must be undertaken in an environmentally sensitive manner.	Contractor	Continuous	√
❖ The Contractor must provide Eskom with the intended actions and programme for site establishment including the site layout, demarcation for hazardous materials storage, soil stockpiles, stormwater management infrastructure, access points for deliveries and services, and the position of site offices and ablutions.	Contractor	Once-off	√
❖ A precautionary approach must be adopted with any works deviating from specifications being approved by both the SS/CM and ECO.	Contractor ECO	Prior to construction	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ All site establishment components must be positioned to • imit visual intrusion on neighbours; and • inimise the area disturbed.	Contractor ECO CECO	Continuous	
❖ Operation of heavy machinery and construction equipment known to produce high noise levels shall be limited. Silent compressors must be used. Noise generated by employees shouting or whistling must also be limited.	Contractor, Eskom	Continuous	
❖ Operations activities must only occur during daylight hours 06H00 to 18H00. Any activities outside of these time frames must be approved by the local communities and land owners.	Contractor CELO	Continuous	
❖ Appropriate safety and precaution signs shall be erected prior to the start of operationalat all access points to and from the site and all areas in close proximity to the public.	Eskom Contractor	Continuous	
▪ **Access to Site**			
❖ The site and associated infrastructure and equipment shall be off-limits to the public.	Eskom	Continuous	
❖ Vehicle speeds shall not exceed 40km/h along un-tarred roads on private property or when traversing unconsolidated and non-vegetated areas. Where necessary, speed limits must be indicated on the roads.	Eskom	Continuous	
❖ Access routes shall be planned in conjunction with the Contractor, Eskom and the Landowners. All agreements reached shall be documented in writing and no verbal agreements should be made.	Contractor Eskom	Continuous	√
❖ The EEO shall, together with a representative of the Contractor (EO) and the ECO, negotiate with each landowner the access route to reach the servitude and each tower position. The access agreement will be formalized in the form – "Access to Farms" and signed by the three parties (refer to **Appendix 9**). ❖ The Contractor will mark the proposed route and/or a competent representative will	Eskom	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
accompany the equipment when opening the access gate. ❖ Any deviation from the written agreement shall be closed and re-vegetated immediately.			
❖ The Contractor shall signpost the access roads to the tower positions, immediately after access has been negotiated.	Eskom	Once access has been negotiated.	
❖ Maximum use of both the existing servitudes and the existing roads shall be made. In circumstances where private roads must be used, the condition of the said roads must be recorded prior to use (e.g. photographed) and the condition thereof agreed by the landowner, the SS and the Contractor.	Eskom	Prior to use of roads	
❖ All private roads used for access to the servitude shall be maintained by the Contractor and upon completion of the works, be left in the original condition.	Contractor	Continuous	√
• **Use of existing roads**			
❖ Maximum use of both the existing servitudes and the existing roads shall be made. In circumstances where private roads must be used, the condition of the said roads must be recorded prior to use and the condition thereof agreed by the landowner, the SS and the Contractor.	Contractor Eskom	Prior to use of Roads	
❖ All private roads used for access to the servitude shall be maintained by the Contractor and upon completion of the works, be left in the original condition.	Contractor	Continuous	
❖ Existing water diversion berms are to be maintained during operational and upon completion be repaired as instructed by the SS.	Contractor CELO SS ECO	Continuous	√
❖ Implement dust control measures, such as dampening with water or use of specific chemicals will be implemented where necessary, as indicated by Eskom.	Eskom Contractor CELO	Continuous	√

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ Ensure traffic safety measures (e.g. traffic warning signs, flagmen)are erected to the satisfaction of Eskom. If traffic signs are erected on public roads, the local department of roads must be consulted.	Contractor CELO	Continuous	
• **Closure of roads**			
❖ Upon completion, only roads as indicated by the SS shall be closed.	Contractor SS ECO	Upon completion	√
❖ In areas where no cut or fill has been made, barriers of earth, rocks or other suitable material shall affect closure.	Contractor	Upon completion	
❖ In areas with 30% slope and less, the fill of the road shall be placed back into the roadway using equipment that does not work outside the road cut (e.g. back-hoe). ❖ In areas of greater that 30% slope, the equipment shall break the road shoulder down so that the slope nearly approximates to the original slope of the ground. ❖ The cut banks shall be pushed down into the road and a near normal side slope shall be re-established and re-vegetated.	Contractor ECO	Upon completion	
❖ Replacement of earth shall be at slopes less than the normal angle of repose for the soil type involved.	Contractor ECO	As necessary	
❖ A photographic record of the condition of existing access / private roads to be used shall be made prior to their use for comparison purposes at the end of the period.	Contractor CELO ECO	Prior to construction	
❖ The Contractor shall properly mark all access roads to show the direction of travel (where appropriate). The tower numbers to which the road leads must also be indicated.	Contractor ECO	Prior to construction	
❖ All roads that are not to be used shall be marked with a "**NO ENTRY**" sign.	Contractor ECO	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ All roads closed will be rehabilitated to the surrounding natural areas, with six monthly follow-up to determine success of the rehabilitation as well as to determine if any erosion has occurred. The rehabilitation monitoring should continue as per the rehabilitation plan or until success of the road rehabilitation is assured.	ECO	After road closure and twice yearly	
• **Gate installation and gate control**			
❖ Attention is drawn to the Fencing Act No. 31 of 1963, in particular with regard to the leaving open of gates and the dropping of fences for crossing purposes, climbing, and wilful damage or removal of fences.	Eskom	Continuous	
❖ At points where the line crosses a fence in which there is no suitable gate within the extent of the line servitude, the Contractor must install a servitude gate as detailed in the relevant drawing, based on the SS's instruction and Landowner agreement. The Contractor shall mark these crossing points when the tower positions are being pegged.	Eskom	Prior to tower construction	
❖ All vehicles shall pass through gates when crossing fences and the Contractor shall not be allowed to drop fences temporarily for the purpose of driving over them. No operational work shall be allowed to commence on any section of line, unless all gates in that section have been installed. Installation of gates in fences on major road reserves shall comply with the ordinances of the relevant Provincial Authority. No gates may be installed in fences along National Roads and railway lines.	Eskom	Prior to Construction	
• **Installation of gates**			
❖ Care shall be taken that the gates shall be so erected that a gap of no more than 100mm to the ground is left below the gate (refer to **Appendix 8**).	Eskom	As necessary	
❖ Where required, the Contractor shall replace rusted or damaged wire strands on either side of the gate with similar new wiring to prevent the movement of animals. The extent of the replacement shall be on the SS's instruction.	Eskom	As necessary	
• **Securing of gates**			

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ The Contractor shall ensure that all servitude gates used are kept closed and locked at all times.	Eskom	As necessary	
❖ The Contractor shall provide locks for all servitude gates, and when responsibility of the transmission line is taken over by the Employer, these locks shall be recovered by the Contractor and replaced by locks supplied by the Employer. ❖ The Contractor shall also ensure that all existing farm gates used are kept closed. ❖ The Contractor shall provide the SS with keys for the above locks. No keys shall be provided to landowners to avoid conflict situations between neighbouring landowners.	Eskom	As necessary	
Management objective		**Measurable targets**	
▸ Properly installed gates to allow access to the servitude. ▸ Minimize damage to fences. ▸ Limit access to Eskom and Contractor personnel with gate keys. ▸ Manage the movement of livestock.		▸ **No transgressions of the fencing act and therefore no litigation** ▸ **No damage to fences and subsequent complaints from Landowners** ▸ **All gates equipped with locks and kept locked at all times to limit access to key holders** ▸ **All fences properly tied off to the gate posts** ▸ **All gates properly and neatly installed according to specifications** ▸ **No complaints or claims due to open gates**	
• **Stringing Operations**			
❖ In order to prevent damages to farm land, the necessary scaffolding or protection measures must be installed.	Eskom	Prior to stringing operations	√
❖ The disruption of services must be prevented. All structures supplying services such as telephone and smaller power lines, as well as main roads and farms, must therefore be safeguarded.	Eskom	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ All fences shall be protected against damage during stringing operations. ❖ "Rugby" posts to protect roads and telephone lines shall be made as necessary.	Eskom	As necessary	
❖ The entire footprint of the stringing storage areas shall be monitored.	Eskom	Continuous	
❖ The existing 8m servitude cleared during the tower operational process must be utilized for access of construction machinery required for stringing and bird flapper installation as well as for maintenance. ❖ In the case where the servitude has not been cleared, the ECO must be consulted to ensure sensitive areas such as rocky outcrops, wetland areas, ridges, etc. are not impacted on negatively.	Eskom	Continuous	
❖ Visual degradation of areas where stringing machinery is operated shall be avoided as this may result in severely disturbed vegetation, as traction of machines tear up grass and vegetation. ❖ Disturbed areas shall be repaired as soon as a "span" of 3 to 6 km of the stringing operation is complete. This to be done by the contractor.	Eskom	After every 3 to 6km of stringing is complete	
❖ Should the Contractor want to leave guards on site, this shall be discussed and negotiated with the Landowner. Proper facilities must be provided to ensure sanitation standards are met. Mobile chemical toilets shall be installed at such sites where a large number of the workforce is concentrated.	Eskom	Prior to construction	√
❖ Substantial temporary conductor supports shall be used, or equally effective measures taken, to prevent encroachment of statutory clearances, or other clearance requirements stated in the permits, between the conductor being strung and other power or communication lines, roads or railways being crossed. ❖ Suitable structures under each phase shall be erected to protect all fences from conductor damage during stringing. Temporary changes in poles, fixtures or conductors of lines being crossed shall only be carried out if accepted by the SS. The Contractor shall indicate any changes considered necessary and the SS will co-ordinate any changes with the owner of	Eskom		√

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
the service.			
Management objective		**Measurable targets**	
▸ Prevent damage to expensive structures such as windmills, farmhouse etc. ▸ Prevent disruption of services.		▸ **No claims emanating from damage to supporting structures** ▸ **No complaints or claims arising from disruption of services**	
• **Ablution Facilities**			
❖ Abluting anywhere other than in the toilets shall not be permitted. Under no circumstances shall use of the veld be permitted.	Eskom	Continuous	
❖ Toilets must be secured to prevent them from blowing over.	Contractor ECO	Continuous	
❖ A registered service provider shall be appointed and shall empty toilets regularly.	Contractor ECO	Prior to construction	
❖ Chemical and waste from toilet cleaning operations should not be spilled on the ground at anytime.	Contractor CELO ECO	Continuous	
❖ Ablution facilities must be maintained in a hygienic state and serviced regularly. Toilet paper will be provided. Toilet paper is also a source of littering, and the Contractor shall be forced to clean up any litter.	Contractor CELO	Continuous	
• **Water Management**			
❖ Strict control shall be maintained and the ECO shall regularly inspect the abstraction point and methods used. The connection must be kept in neat working order without leaks or spillages. The ECO should ensure that a WUL and/or registration have been undertaken for the abstraction of water from the abstraction point (borehole, river etc.)	Contractor CELO ECO	Continuous	
❖ Storm water must be effectively captured and led well away from structures.	Contractor CELO ECO	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ No ponding of surface water shall occur adjacent to foundations both during and after construction.	Contractor CELO ECO	Continuous	
❖ No mechanical plant or equipment shall be washed on site, unless in an area equipped for such a purpose.	Contractor CELO ECO	Continuous	
❖ Pollutants such as cement, concrete, lime, chemicals and fuels shall not be discharged into any water source or wetland.	Contractor CELO ECO	Continuous	
❖ Water from ablution facilities and the Contractor's camp shall be discharged into a conservancy/septic tank for removal from the site.	Contractor CELO ECO	Continuous	
❖ The dust control measures, such as watering, chemical stabilisation and the reduction of surface wind speed through the use of windbreaks and source enclosures must be put in place during operational activities. Emission control efficiencies of 50% can readily be achieved through the implementation of effective watering programme for unpaved roads and material handling points.	Contractor CELO	Continuous	
• **Air Quality**			
❖ The production of dust from areas cleared of vegetation and soil stockpiles shall be avoided.	Contractor CELO ECO	Continuous	
❖ Stockpiles shall be located in areas where they are exposed to the minimum erosive effects of wind.	Contractor CELO ECO	As necessary	
❖ Excavation, handling and transport of erodible materials must be avoided under high wind conditions.	Contractor CELO	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
❖ Dust-suppression measures must be used on stockpiles and exposed areas.	Contractor CELO	As necessary	
❖ All machinery and equipment to be used on site shall be properly serviced and in good working order to avoid excessive smoke and exhaust fumes.	Contractor	Continuous	
• **Erosion and Sedimentation Control**			
❖ Areas susceptible to erosion shall be protected by installing temporary and permanent drainage works.	Eskom Contractor CELO ECO	As necessary	√
❖ Cleared areas must be stabilized and managed to prevent and control erosion. The method of stabilization shall be determined in consultation with the SS.	Eskom Contractor CELO SS ECO	As necessary	
❖ Measures must be implemented to protect the site from erosion by stormwater.	Eskom Contractor ECO	Continuous	
❖ Vehicular traffic shall not be allowed in permanently wet areas.	Eskom Contractor ECO	Continuous	
❖ No damage shall be caused to wet areas.	Eskom Contractor ECO	Continuous	
❖ Where necessary, alternative methods of operationalshall be used to avoid damage to wet areas.	Eskom Contractor	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
❖ Any work or access near or in a permanent drainage system may have implications in terms of the National Water Act, 1998 (Act No. 36 of 1998), and therefore may well require the application of a Water Use License. Therefore, the contractor must in consultation with the ECO and a representative of Eskom, assess all areas along the alignment well in advance in order to ensure the relevant Water Use License is applied for where required.	Eskom Contractor ECO	As necessary	
Management objectives		**Measurable targets**	
▸ **Avoid wet areas to prevent damage.** ▸ **Avoid the requirement for additional environmental authorisations as a result of working in wetlands.**		▸ **No damage to wet areas** ▸ **No complaints from landowners and litigation**	
• **River crossings**			
❖ Stream and river crossings shall be avoided as far as practicable as they may cause erosion and downstream siltation.	Contractor CELO ECO	As necessary	
❖ Existing drifts and bridges may be used at the consent of the landowner. However, such structures must be examined for strength and durability before being used.	Contractor ECO	As necessary	
❖ In the event of a need for new bridges and drifts to be constructed, approval must be sought from Eskom and the Landowner and this must be done in consultation with the ECO. ❖ An environmental authorization will be required under the National Environmental Management Act, 1998 (Act No.107 of 1998).	Contractor ECO	As necessary	√
❖ All structures constructed for river access purposes shall be properly designed and drawings of such structures shall be available for record purposes.	Contractor CELO ECO	Continuous	
Management objectives		**Measurable targets**	
▸ Minimize damage to river and stream embankments.		▸ **No new access roads through river and stream banks**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
▸ Minimize erosion of embankments and subsequent siltation of rivers, streams and dams.		▸ **No visible erosion scars on embankments once operationalis completed**	
• **Erosion and Donga Crossings**			
❖ Where necessary, crossing of dongas and eroded areas shall be thoroughly planned.	Eskom Contractor CELO ECO	As necessary	
❖ Water diversion berms shall be installed at donga crossings to ensure water runoff from the power line servitude does not run into dongas and cause or exacerbate an erosion hazard.	Eskom Contractor CELO ECO	As necessary	
❖ Suitable erosion containment structures shall be constructed at donga crossings where required and viable.	Contractor CELO ECO	As necessary	
❖ All structures shall be properly designed and drawings shall be available for reference purposes.		As necessary	
❖ No unplanned / improperly planned cutting of donga embankments are allowed as this leads to further erosion and degradation of the environment.	Contractor CELO ECO	Continuous	
❖ In general, soil disturbance should be kept to a minimum. The disturbance of land contour banks or other erosion control structures shall be avoided.	Contractor ECO	As necessary	
Management objectives		**Measurable targets**	
▸ Minimize erosion damage on donga crossings. ▸ Minimize impeding the natural flow of water. ▸ Minimize initiation of erosion through donga embankments.		▸ **No disturbance to donga embankments** ▸ **No erosion visible on donga embankments due to operational activities**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
		▸ **No interference with the natural flow of water**	
• **Landscaping and Re-vegetation**			
❖ General disturbance of land surface will degrade by erosion. Permanent visual scarring will result. ❖ The Contractor shall rip all areas compacted by machinery, smooth off and integrate disturbed areas visually into surrounding landform using spoil rock and stockpiled top layer of soil. ❖ Where practically possible, the Contractor shall temporally fence the area (with four strands of wire) until vegetation has been re-established to ensure that game and livestock do not have access to areas that are on slopes and on erodible soils. The fencing aspect shall be agreed with the landowner prior to erection. Consultation with landowner should be undertaken to determine the preferred rehabilitation strategy.	Eskom Contractor ECO	As necessary	
❖ The removal or picking of any protected or unprotected indigenous plants is not permitted without the applicable permits or outside the servitude.	Eskom Contractor ECO	Continuous	
❖ All declared aliens shall be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	Contractor ECO	Continuous	
❖ The establishment and re-growth of alien vegetation must be controlled after the removal of grass.	Contractor ECO	As necessary	
❖ No damage shall be caused to any farms unless both the landowner and the SS, prior to the work commencing agree upon the extent of the intended damage.	Contractor ECO	As necessary	
• **Landscaping, stabilisation and soil stockpiling**			
❖ Exposed slopes and/or destabilized areas should be landscaped to blend in with the surrounding area.	Eskom Contractor ECO	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ In exposed areas with slopes steeper than 1:3, re-vegetation should not be used as the primary means of stabilization. Such slopes should rather be stabilized by suitable structures agreed to by the ECO which can be enhanced by re-vegetation to facilitate blending with the environment.	Eskom Contractor ECO	As necessary	√
❖ Erosion of rehabilitated areas shall be prevented.	Eskom Contractor CELO ECO	As necessary	
• **Re-vegetation**			
❖ Exposed areas with slopes less than 1:3 should be rehabilitated with a grass mix that blends in with the surrounding vegetation. ❖ The grass mix should consist of a mix of *Cynodondactylon* (50%); *Eragrostiscurvula* (30%) and the remainder should consist of other pioneer grass species suitable for the area (20%). The introduction of forbs from the Fabaceae family is also recommended. A specialist should be consulted to determine the quantity per area (e.g. kg per ha) for re-seeding.	Contractor CELO ECO	As necessary	
❖ In the local situation the areas that are re-vegetated will stand out amongst the grasses in the area. ❖ Therefore, the re-vegetated areas should be properly fenced, where practically possible, until the grass sward is well established to protect it from overgrazing and trampling by livestock and game. ❖ The fertiliser should be applied conservatively, just enough in order to help the grasses to establish. ❖ Re-vegetation should take place within the rainy season and water of a reasonable quality will have to be supplied as needed until the grasses reach the seed-filling stage.	Contractor CELO ECO	As necessary	
❖ The re-vegetated areas should be temporarily fenced, with agreement of the landowner	Contractor	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
(with four strands of wire) to prevent damage by grazing animals. Consultation with landowner should be undertaken to determine the preferred rehabilitation strategy.	CELO ECO		
❖ Re-vegetated areas should be monitored every 4 months for the first 12 months and once a year thereafter for the maintenance period of two years.	Contractor	Continuous	
❖ Re-vegetated areas showing inadequate surface coverage (less than 30% coverage, 8 months after re-vegetation) should be prepared and re-vegetated from scratch.	Contractor CELO ECO	As necessary	
❖ Damage to re-vegetated areas should be repaired promptly.	Contractor ECO	As necessary	
❖ Exotic weeds and invaders that might establish on the re-vegetated areas should be controlled to allow the grasses to properly establish.	Contractor ECO	As necessary	
❖ Weed control methods should be confirmed with the PM to prevent any undesirable secondary impacts.	Contractor ECO	As necessary	
Management objectives		**Measurable targets**	
▸ Minimize damage to vegetation. ▸ Keep servitude as natural looking as possible. ▸ Minimize interference by vegetation to pylon and power lines. ▸ Minimize possibility of erosion due to removal of vegetation. ▸ Minimize removal of plant material on river and stream embankments. ▸ Eradication of alien invader species. ▸ Minimize scarring of the soil surface and land features. ▸ Minimize disturbance and loss of topsoil Rehabilitate all disturbed areas along the servitude.		▸ **No vegetation interfering with structures as per statutory safety requirements, upon completion of the contract** ▸ **No de-stumping of vegetation on river and stream embankments** ▸ **All alien invaders removed** ▸ **No visible herbicide damage to the vegetation along the servitude one year after completion of the contract due to incorrect herbicide use** ▸ **No litigation due to unauthorized removal of vegetation** ▸ **No visible erosion scars once operation is completed** ▸ **No claims regarding damage leading to litigation** ▸ **All damaged areas successfully rehabilitated one year after**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
		completion	
• **Fauna Protection**			
❖ It is illegal to interfere with any wildlife or other fauna. All fauna occurring on-site shall be protected. Hunting and snaring must not be permitted.	Eskom Contractor ECO	Continuous	
❖ Should any new sites or nests be found, during the construction process, that was not known or have been noted before, each site shall be assessed for merit and the necessary precautions be taken to ensure the least disturbance.	Contractor CELO ECO	Continuous	
• **Archaeology / Heritage**			
❖ If any heritage/archaeological sites/objects are discovered during the construction or operational processes, the ECO or other relevant person on site should note the location of and ensure that such sites/objects are not disturbed/ destroyed and contact the Eskom Environmental Advisor and South African Heritage Resources Association (SAHRA).	Eskom Contractor ECO	As necessary	
❖ In the event that any heritage/archaeological sites are discovered during construction they shall be demarcated with wire fencing with a radius of at least 30m. Construction teams shall not be allowed access to these sites. ❖ No construction camps shall be allowed within 50m of any known archaeological sites. ❖ The collection of heritage/archaeological objects/artefacts at identified sites shall not be allowed.	Eskom Contractor ECO	As necessary	√
❖ Any destruction of a heritage site can only be allowed once a permit is obtained from SAHRA and the site has been mapped and noted. ❖ Permits shall be obtained from the SAHRA should the proposed line affect any heritage sites.	Eskom Contractor ECO	As necessary	
Management objectives		**Measurable targets**	
▸ The preservation and appropriate management of new archaeological finds, should these be discovered		▸ **No destruction of or damage to new heritage sites**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
during construction.			
• **Infrastructure**			
❖ Where pipelines are found along the route, the depth of the pipes under the surface shall be determined to ensure that proper protection is afforded to such structures. ❖ All pipelines shall be clearly marked and protected. ❖ Any damage to pipe lines shall be repaired immediately and the cost will be for the contractors account.	Eskom Contractor ECO	As necessary	
❖ It is probable that the use of private roads for operational purposes would lead to damage due to heavy equipment and frequent use. The Contractor shall be responsible to repair roads if damaged. Photographs must be taken of the road prior and post use to prove the extent of the damage caused by activities. ❖ All existing private access roads used for construction purposes, shall be maintained at all times. This will ensure that the local people have free access to and from their properties.	Eskom Contractor ECO	As necessary	
❖ Some Landowners use electrically driven farming activities such as irrigation. Power cuts to facilitate construction and especially stringing shall therefore be carefully planned. ❖ Disruptions shall be kept to a minimum. They should be well advertised and communicated to the Landowners prior to it the power being cut. ❖ Care must be taken not to damage irrigation equipment, lines, channels and crops, as this could lead to major claims being instituted against Eskom and the Contractor. ❖ The position of all pipelines and irrigation lines must be obtained from the Landowners and be shown on the access plans.	Eskom Contractor CELO ECO	Prior to power cuts	
Management objectives		**Measurable targets**	
▸ **The control of temporary or permanent damage to landowner's equipment and installations.** ▸ **Control of interference with the normal operation of landowner's equipment and installations.** ▸ **Securing of the safe use of infrastructure, landowner's equipment and installations.**		▸ **No unplanned disruptions of services** ▸ **No damage to any plant or installations** ▸ **No complaints from authorities or Landowners regarding disruption of services**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
		▸ **No litigation due to losses of landowner's equipment, installations and crops**	
• **Materials Use, Handling, Storage and Transport (Cement, Fuel [Petrol and Diesel] and Oils)**			
❖ Procedures for material handling shall be discussed with and approved by the ECO.	Eskom Contractor ECO	Once-off	
❖ Relevant national, regional and local legislation regarding the transport, use and disposal of hazardous waste must be adhered to at all times.	Eskom Contractor ECO	Continuous	
❖ Hazardous waste generated during construction must be classified in terms of the Hazardous Substances Act.	Eskom ECO Contractor	As necessary	
❖ A permit must be obtained if the storage, handling, transporting and disposal of any hazardous waste are within the thresholds stated in the NEMWA. The permit will have specific conditions that must be adhered to in accordance with the hazardous waste class.	Eskom ECO Contractor	As necessary	
❖ Hazardous waste must be disposed of at either a licensed H: h or H: H waste disposal site depending on the class of hazardous waste being disposed.	Eskom ECO Contractor	Continuous	
❖ An emergency procedure to deal with accidents and incidents (e.g. spills) arising from hazardous substances shall be compiled and implemented.	Eskom Contractor ECO	Once-off	√
❖ All mechanical equipment used in operationalactivities shall be clean and free of oil, petrol, and diesel leaks.	Eskom Contractor ECO	Continuous	
❖ Spills of hazardous substances, in excess of one litre shall be reported to the ECO immediately and the appointed Tx Services Environmental Advisor (Tx Key Performance	Eskom Contractor	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
Indicator requirement).	ECO		
❖ A register for spills and incidents involving hazardous materials shall be maintained. ❖ Soil or yard stone, which has been contaminated, shall be removed and disposed of at an approved waste disposal site. ❖ Alternatively, contaminated soil can be treated on site through bioremediation. Should a person experienced in bioremediation not be available on site, a specialist contractor shall be used. ❖ Such spills must be cleaned and remediated to the satisfaction of the ECO. ❖ A method statement is required from the Contractor that details the procedure to be followed in dealing with leaks or spills.	Eskom Contractor CELO ECO	As necessary	√
❖ A complete emergency spill kit shall be available on site at all times. The Contractor must also ensure that relevant staff members are trained to use the emergency spill kit and on the manner in which to deal will spills of hazardous substances (oils, diesel or petrol).	Eskom Contractor ECO	Continuous	
❖ A concrete platform with a bund wall must be allocated to accommodate fuel, oil paint, bitumen, herbicide and insecticides to guard against infiltration of hazardous substances into the soil. Fuel tanks must be bunded to hold 110% of the contents of the tank. The tanks shall be housed in a roofed area so that no water will collect within the bund wall. It is recommended that the most preferable site for these activities may be at one of the existing substations.	Eskom Contractor ECO	Once-off	√
❖ All staff handling hazardous waste must be trained accordingly.	Eskom Contractor ECO	Once-off	
❖ All necessary approvals with respect to fuel storage and dispensing shall be obtained from the appropriate authorities.	Eskom Contractor ECO	As necessary	
❖ Areas of fuels storage and other flammable materials shall comply with standard fire safety	Eskom	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
regulations and will require the approval of the SS/CM and the local Fire Prevention Officer.	Contractor SS ECO		
❖ No smoking shall be allowed in the vicinity of the stores and adequate fire-fighting equipment shall be accessible at fuel storage area and areas in the vicinity of the storage area. "**No smoking**" and "**Danger**" signs shall be erected at hazardous substance storage areas.	Eskom Contractor	Continuous	
❖ All empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected.	Eskom Contractor	Continuous	
• **Batching Plants**			
❖ Concrete shall not be mixed directly on the ground.	Eskom Contractor ECO	Continuous	
❖ The concrete batching activity shall be located in an area of low environmental sensitivity. The site for the batch plant shall be indicated on the site layout program.	Eskom Contractor ECO	Once-off	√
❖ All wastewater resulting from batching of concrete shall be disposed of via the wastewater management system.	Eskom Contractor	Continuous	
❖ Suitable screening and containment must be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations.	Eskom Contractor	Continuous	
❖ The Contractor shall be responsible for negotiating the site of his batching plant (if required) and the conditions under it may be established, with the landowner. The Contractor shall be responsible for the proper management of the batching plant.	Eskom Contractor CELO	As necessary	√
❖ The use of local water for concrete must first be negotiated with the landowner and the appropriate authorities. Such water is to be analyzed and accepted by the PM before use.	Eskom Contractor PM	Prior to batching	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
❖ Upon completion of works, the ground of the batching plant area shall be rehabilitated and the site cleaned and left as it was found and to the satisfaction of the SS and landowner.	Eskom Contractor ECO	Upon completion	
• **Servicing of vehicles**			
❖ Servicing of vehicles in the veld is strictly prohibited.	Eskom Contractor ECO	Continuous	
❖ Only emergency repairs shall be allowed on site and a drip tray shall be used to prevent oil spills.	Eskom Contractor ECO	As necessary	
❖ All vehicles shall be serviced in the designated area.	Eskom Contractor ECO	As necessary	
❖ In the event of a breakdown in the veld, any oil spills shall be cleaned up and the following shall apply: ❖ All contaminated soil shall be removed and be placed in containers. ❖ Contaminated soil can be taken to one central point at the Contractors campsite where bioremediation can be done. ❖ Smaller spills can be treated on site. ❖ A specialist Contractor shall be used for the bio-remediation of contaminated soil. ❖ The area around the fuel storage drum at the Contractor's campsite shall also be re-mediated upon completion of the contract ❖ All oil spills must be reported to the ECO and SS.	Eskom Contractor ECO	As necessary	√
Management objective		**Measurable targets**	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
▸ Prevention of pollution of the environment. ▸ Minimize chances of transgression of the legislation controlling pollution.		▸ **No pollution of the environment** ▸ **No litigation due to transgression of pollution control acts** ▸ **No complaints from Landowners**	
• **Fire Prevention**			
❖ The Contractor must document a fire reduction management plan. The plan will identify sources of fire hazards, and appropriate management measures to reduce the identified risk. The relevant authority will be notified of such potential fire hazards.	Eskom Contractor CELO	As necessary	
❖ No fires shall be allowed on site under any circumstance even for that of cooking in the manner indicated below (The Forest Act, No 122 of 1984).	Eskom Contractor CELO ECO	Continuous	
❖ In terms of the Atmospheric Pollution Prevention Act (APPA), burning is not permitted for waste disposal.	Eskom Contractor CELO ECO	Continuous	
❖ Accidental fires in natural grassland should be prevented through proper sensitization of the contractors and their workers towards the associated risks, dangers and damage of property.	Eskom Contractor ECO	Continuous	
❖ The Contractor shall have fire-fighting equipment, for each operational team readily available on site, especially during the winter months. The fire fighting equipment shall be regularly checked and shall be approved by the ECO / Safety and Health Officer on site.	Eskom Contractor ECO	Continuous	
❖ An emergency preparedness Program should be in place in order to fight accidental veld fires, should they occur. The adjacent land owners/users/managers should also be informed and/or involved.	Eskom Contractor ECO	Continuous	√
❖ The use of open fires for cooking of food etc. by and maintenance personnel should be strictly prohibited. Temporary enclosed areas (windshield) for food preparation should be	Eskom Contractor	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
provided specifically for this reason. The Contractor shall supply alternative cooking facilities.			
Management objectives		**Measurable targets**	
▸ Minimize risk of veld fires. ▸ Minimize damage to grazing. ▸ Prevent runaway fires.		▸ **No veld fires started by the Contractor's work force** ▸ **No claims from Landowners for damages due to veld fires** ▸ **No litigation**	
• **Emergency Procedures**			
❖ Emergency procedures shall be set up prior to the commencement of work. It must include but not be limited to fires, spills, and contamination of ground and surface water, accidents to employees and damage to services.	Eskom Contractor ECO	Once-off	√
❖ Key staff shall be trained in emergency response and all staff made aware of the emergency procedures.	Eskom Contractor ECO	As necessary	
❖ A register of all incidents, accidents, etc. must be maintained, which includes the action taken after the event has occurred. The ECO must be informed of the event.	Eskom Contractor CELO ECO	Continuous	
❖ The site and all operations shall comply with all National Health and Safety Standards and other relevant national, regional and local regulations. Eskom shall appoint a Health and Safety (H&S) Officer.	Eskom Contractor ECO	Continuous	
❖ The Contractor is liable for any expenses incurred by any organizations called to assist with fighting fires and any cost relating to the rehabilitation of burnt areas/and/or properties and persons should the fire be the cause of the Contractor's activities on site.	Eskom Contractor ECO	As necessary	
❖ All equipment shall be user safe and vehicles shall be roadworthy.	Eskom	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	Contractor ECO		
• **Health and safety**			
❖ A medical and safety induction must be prepared and must be undertaken prior to entering the site.	Eskom Contractor	As necessary	
❖ No site staff other than security personnel shall be housed on site.	Eskom Contractor ECO	Continuous	
❖ Potable water and washing facilities shall be made available for all personnel.	Eskom Contractor ECO	Continuous	
❖ Public access to the operationalsite shall be prevented at all times.	Eskom Contractor ECO	Continuous	
❖ Portable toilets shall be provided on site. The toilets must be cleaned regularly and the number of toilets shall be based on a minimum ratio of 15 people per toilet.	Eskom Contractor ECO	Continuous	
❖ Designated eating areas shall be allocated.	Eskom Contractor ECO	Continuous	
❖ Staff must wear the necessary personal protective equipment.	Eskom Contractor ECO	Continuous	
❖ Daily clean up of working areas will take place and safety notices or tape placed in areas of danger	Eskom Contractor	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
▪ **Prevention of disease**			
❖ All the necessary precautions against the spreading of disease, especially in farms with livestock and game, shall be taken.	Eskom Contractor ECO	Continuous	**√**
Management objective		**Measurable target**	
▸ Prevent litigation due to infestation of livestock or game.		▸ **No complaints and claims from Landowners** ▸ **No litigation**	
• **Waste management**			
❖ An on-site waste management program to prevent the spread of refuse within and beyond the site shall be developed and implemented.	Eskom Contractor SS ECO	Once-off	**√**
❖ Sufficient bins with secure lids for waste disposal purposes shall be provided. These bins must be emptied regularly. The waste must be disposed at a registered/ permitted waste disposal site.	Eskom Contractor ECO	Continuous	
❖ A daily clean-up of the site must be maintained.	Eskom Contractor ECO	Continuous	
❖ No waste shall be buried or burned on site. All solid waste collected on site shall be disposed of offsite at an appropriate permitted landfill site. Where a permitted landfill site is not available in proximity to the operational site, the Contractor must provide a method statement with regard to waste management.	Eskom Contractor ECO	Continuous	**√**

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
❖ Covered waste bins shall be supplied by the contractor.	Eskom Contractor ECO	As necessary	
❖ The site office and materials storage area must be kept neat and tidy and free of litter.	Eskom Contractor ECO	Continuous	
❖ Littering by the employees of the Contractor shall not be allowed.	Eskom Contractor ECO	Continuous	
❖ The Contractor shall collect all litter and dispose thereof in terms of the approved waste management Program.	Eskom Contractor ECO	Continuous	
❖ Refuse generated from the campsite, operational area, storage area or any other area shall be collected and placed in a skip on a daily basis.	Eskom Contractor ECO	Continuous	
❖ A litter patrol around the operational camp and work areas as well as along the alignment are to take place every day to collect any litter that may have been strewn around.	Eskom Contractor ECO	Continuous	
❖ A skip, with a cover, must be used to contain refuse from campsite bins, rubble and other operationalmaterial.	Eskom Contractor ECO	Continuous	
❖ Once full and on a regular basis, the contents of the skip must be disposed of at a permitted landfill site.	Eskom Contractor ECO	Continuous	
❖ No hazardous material, e.g. oil or diesel fuel shall be disposed of in any unregistered waste site.	Eskom Contractor	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
	ECO		
❖ Material that may harm humans or animals must not be left on site.	Eskom Contractor ECO	Continuous	
❖ Any broken insulators shall be removed and all shards picked up. Broken, damaged and unused nuts, bolts and washers must be picked up and removed from site.	Eskom Contractor ECO	Continuous	
❖ The piling of any material that could rot and release unpleasant smells into the air will not be permitted.	Eskom Contractor ECO	Continuous	
❖ Surplus concrete may not be dumped indiscriminately on site, but must be disposed of at a licensed landfill site, or in designated areas agreed by the Landowner and ECO.	Eskom Contractor ECO	Continuous	
❖ Concrete trucks shall not be washed on site after depositing concrete into foundations. Any spilled concrete shall be cleaned up immediately.	Eskom Contractor CELO ECO	Continuous	
Management objectives		**Measurable targets**	
▸ Neat workplace and site. ▸ To keep the servitude neat and clean. ▸ Disposal of rubble and refuse in an appropriate manner. ▸ Minimize litigation. ▸ Minimize Landowner complaints.		▸ **No complaints from Landowners** ▸ **No rubble or refuse lying around on site** ▸ **No incidents of litigation** ▸ **No complaints from Landowners** ▸ **No visible concrete spillage on the servitude**	
▪ **Bird Flight Diverters**			
❖ In areas where there is a potential for bird collisions (especially rare or endangered species) with new overhead lines or where there are actual collisions on existing lines it is advisable	Eskom	As necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
to install bird flappers or bird flight diverters on the earth wires. Collisions should be reported to Eskom so that the matter can be resolved.			
❖ Transmission shall use the <u>double loop bird flight diverter (BFD):</u> • Black and white spirals are of preformed 14mm diameter PVC UV stabilized rod. • Half of the spirals must be of white colour and the other half must be of black colour. • Diverters should be fitted to the entire span	Eskom	As necessary	
❖ Installation of the bird flight diverters at specific spans as per the Avifaunal specialist report must be: • Installed on both earth wires, staggered; • Installed only on 60% of the span and in the middle of the span; and • On the lower middle lower span, spirals must be installed at 10 metre intervals on each earth wire and with alternating colours on each side.	Eskom PM ECO Contractor	As necessary	
▪ **Sanitation**			
❖ Ensure that proper sanitation is achieved ❖ No complaints received from Landowners regarding sanitation ❖ Regular cleaning of and empting of sanitation equipment must take place ❖ All staff must be provided with adequate sanitation facilities and equipment.	Eskom ECO Contractor	Continuous	√
▪ **Destruction of heritage resources**			
❖ Operationalpersonnel must be alert and must inform the ECO and Eskom should they come across any findings. ❖ Should any additional archaeological artefacts be exposed during excavation, work on the area where the artefacts were found, must cease immediately and the ECO must be notified as soon as possible. ❖ Upon receipt of such notification, the ECO must be notified and Eskom should arrange for the excavation to be examined by an Archaeologist as soon as possible. ❖ Under no circumstances shall archaeological artefacts be removed, destroyed or interfered	Eskom		

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
with. ❖ Any archaeological sites exposed during operational phase may not be disturbed prior to authorization by the South African Heritage Resources Agency. The removal, exhuming, destruction, altering or any other disturbances of heritage sites must be authorized by SAHRA in terms of the National Heritage Resources Act (Act No. 26 of 1999).			
▪ **Traffic impact**			
❖ Vehicular movement beyond the property boundaries should be limited during peak hour. Access to the site must follow current and established routes. ❖ It must be ensured that a backlog of traffic does not develop at the access points during peak hours, through the implementation of an efficient and effective access control system. ❖ Security fence at the campsite is to be inspected daily to ensure no illegal entry points are created.	Eskom	As a Necessary	
▪ **Crime, safety and security**			
❖ Illegal occupants on the property must be removed to ensure no uncontrolled fires, cutting down of vegetation and littering. ❖ The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the National Building Regulations. ❖ Ensure the contacts details of the police or security company and ambulance services are available on the site. ❖ Ensure that the handling of equipments and materials is supervised and adequately instructed. ❖ Do not allow the movement of public within the development site by posting notices at the entrance gates, and where necessary on the boundary fence. ❖ Appropriate notification signs must be erected, warning the residents and visitors about the hazards around the operation site and presence of heavy vehicles. ❖ No collecting of wood or the removal of wood or any item not associated with the operation	Eskom	Continuous	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
activities will be allowed. ❖ No picking, pouching or snaring and killing of any fauna or flora will be allowed.			
▪ **Atmospheric pollution**			
❖ Dust production must be controlled by regular watering of roads and works area, should the need arise. ❖ Points of ingress and egress onto the site must be regularly cleaned for dust and mud. ❖ No refuse wastes are burnt on the premises or on surrounding premises. ❖ All vehicles transporting material that can be blown off (e.g. soil, rubble etc.) must be covered with a tarpaulin, and speed limits of 30 km/h must be adhered to. ❖ Vehicles to be used during the operational phase are to be kept in good working condition so as not to be the source of excessive fumes and nuisance.	Eskom	As a necessary	
▪ **Vegetation clearance and maintenance**			
❖ No less than an 8 metre (or as determined per site) wide strip of identified vegetation along the centre line of the power line should be cleared (Refer to **Appendix 10**). ❖ Clear all vegetation within proposed tower position and within a maximum (depending on the tower type and voltage) radius of 5 m around the position, including de-stumping /cutting stumps to ground level, treating with an herbicide and re-compaction of soil (Refer to **Appendix 10**). ❖ Selective trimming or cutting down of Indigenous vegetation within servitude area interfering or posing a threat to the integrity of the power line (Refer to **Appendix 10**). ❖ Deep valleys and environmentally sensitive areas that restrict vehicle access, or legally protected areas, shall not be cleared of vegetation provided that the vegetation poses no threat to the safe operation and reliability of the power line. In the case of the operation of new power lines, a one (1) metre “trace-line” may be cut through the vegetation for stringing purposes only and no vehicle access shall be allowed along the cleared “trace-line”. Alternative methods of stringing across inaccessible valleys should however be	Eskom	As a necessary	

Environmental Specification	Responsible Individual	Frequency	**Method Statement Required**
considered (see refer to **Appendix 10**). ❖ It shall be ascertained from the property owners concerned whether they wish to retain the cut vegetation. If not, it shall be removed, or disposed of in an appropriate manner to the satisfaction of the owner. Burning shall not be permitted under any circumstance.			

11.Spatial Position of the Proposed 400Kv Transmission Power Line

The map represents the entire study area and has been divided into three sections (figure 4-7). On each section of the map represents the pylon positions that were all visited by specialists.

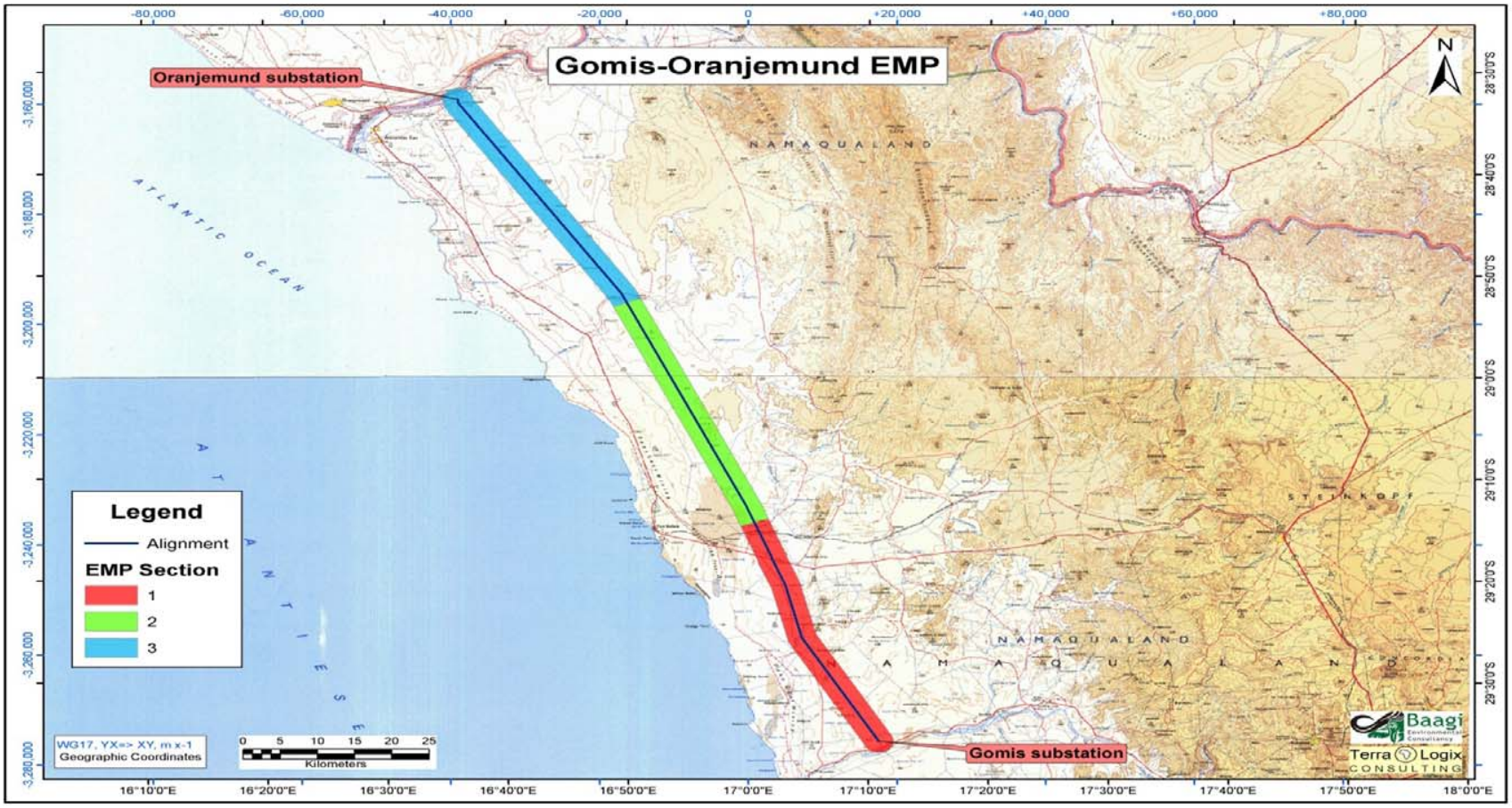

Figure 4: The entire study area with all three sections

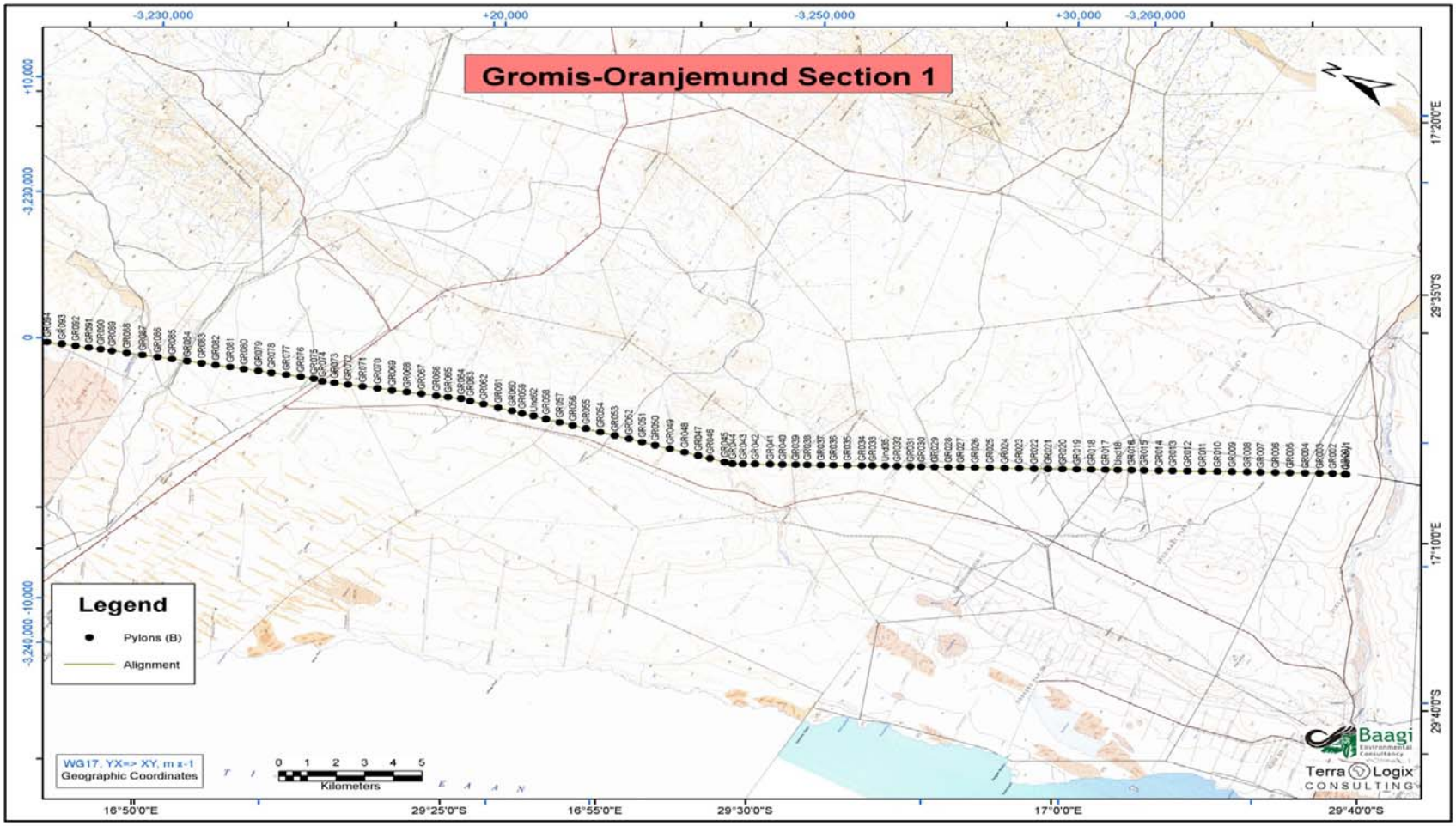

Figure 5 :Section 1 of the study area with the pylon positions

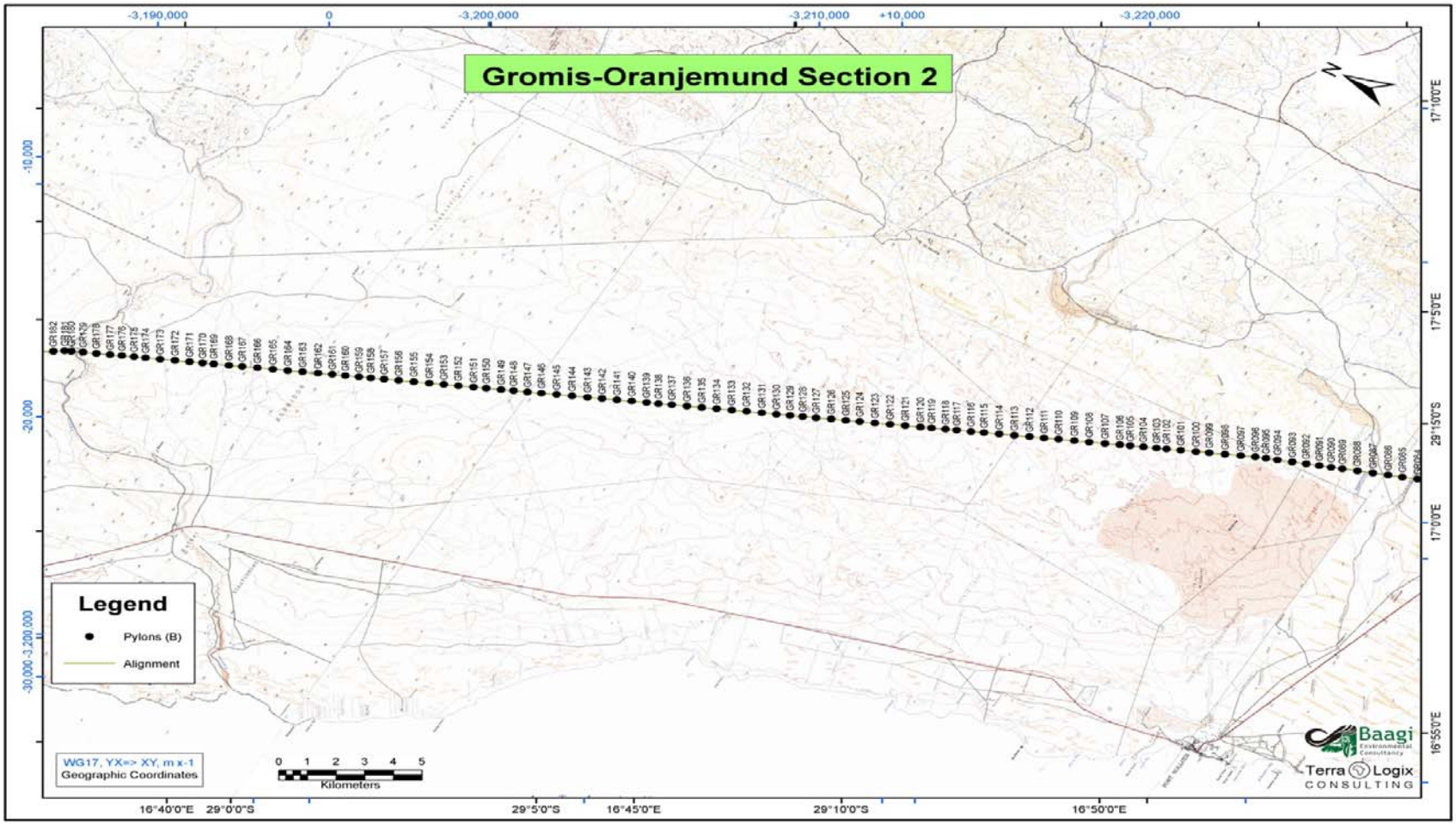

Figure 6: Section 2 of the study area with pylon positions

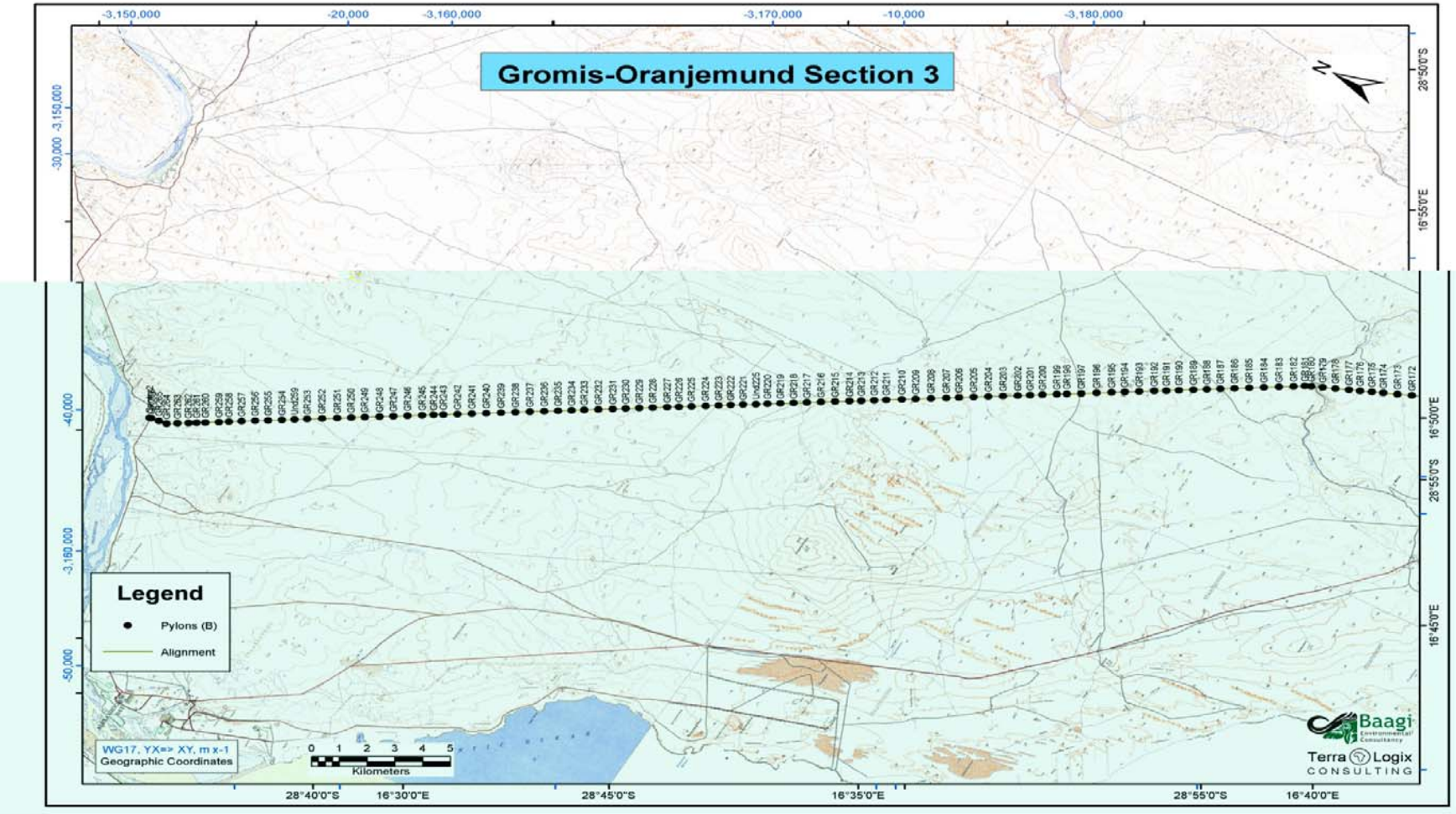

Figure 7 : Section 3 of the study area with pylon positions

C. SECTION 3: CONCLUSIONS

This Environmental Management Program should be used as an on-site reference document during all phases of this development, and auditing should take place in order to determine compliance with this EMPR. Parties responsible for transgression of this EMPR should be held responsible for any rehabilitation that may need to be undertaken. Parties responsible for environmental degradation through irresponsible behaviour / negligence should receive penalties.

Process facilitated the identification of relevant and practical mitigation measures, which may be used by the construction team and Eskom to draw up and respond to tender documentation. It is thus a key to this process that this document is included during tendering to allow all potential bidders for this work to seriously consider and cost for such mitigation. This will ensure that the document receives the necessary buy in that it requires from the outset of the project.

This EMPR was compiled in an iterative manner that allowed for a pre-screening of the pylons by the specialist team. This enabled specialists to identify pylons that could be moved slightly from one position to another to avoid more sensitive environmental features, such as drainage lines, areas susceptible to erosion and heritage artefacts. This in turn made it possible for the technical team to revise all the profiles to the agreement of all specialists concerned.

In order to have records of environmental incidences and the handling thereof, it is suggested that incidence logs (**Appendix 1**) be filled in by the Environmental Control Officer or Environmental Liaison Officer. The contract manager needs to be informed of such incidences and further actions need to be taken, should the need arise.

APPENDIX 1: INCIDENT AND ENVIRONMENTAL LOG

ENVIRONMENTAL INCIDENT LOG				
Date	*Environmental Condition*	Comments (Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)	Corrective Action Taken (Give details and attach documentation as far as possible)	**Signature**

APPENDIX 2: DECLARATION OF UNDERSTANDING BY DEVELOPER, ENGINEER AND CONTRACTOR

DECLARATION OF UNDERSTANDING BY THE DEVELOPER

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Program for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness2: _____

DECLARATION OF UNDERSTANDING BY THE ENGINEER

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Program for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness2: _____

DECLARATION OF UNDERSTANDING BY THE CONTRACTOR

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Program for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness2:

APPENDIX 3: OIL SPILL CLEAN-UP AND REHABILITATION

APPENDIX 4: SAFETY, HEALTH, ENVIRONMENT & QUALITY (SHEQ) POLICY

APPENDIX 5: RECORD OF DECISION

APPENDIX 7: GATE INSTALLATION GUIDELINES

APPENDIX 8: ACCESS TO FARMS REPORT

APPENDIX 9: VEGETATION CLEARANCE GUIDELINES REPORT