

**PROPOSED 132 KV TRANSMISSION LINE CORRIDOR
ADJACENT TO THE EXISTING ESKOM TRANSMISSION
LINE FROM LONGYUAN MULILO DE AAR 2 NORTH WIND
ENERGY FACILITY TO THE HYDRA SUBSTATION IN DE
AAR, NORTHERN CAPE**

**DRAFT LIFE-CYCLE ENVIRONMENTAL
MANAGEMENT PROGRAMME**

APRIL 2014



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CONTENTS

PROJECT DETAILS	i
1 Overview	4
2 Planning and design phase	9
3 Compliance monitoring.....	24
4 Construction Phase EMP	26
5 Operational Framework EMP	25
6 Decommissioning.....	30
7 Conclusion	31

List of Tables:

Table 1: Section 33 of EIA Regulation R543 listing the requirements of an EMP

Table 2: Section 24N (2) and (3) of NEMA listing the requirements of an EMP

Table 3: Framework OEMP

List of Appendices:

Appendix A: Curriculum Vitae of Environmental Assessment Practitioners

Appendix B: Construction EMP General Specifications (Comprehensive)

ABBREVIATIONS

CEMP	Construction Phase Environmental Management Programme
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Reports
EMP	Environmental Management Programme
LEMP	Life-Cycle Environmental Management Programme
NEMA	National Environmental Management Act (No. 107 of 1998)
OHS	Occupational Health and Safety Act (No. 85 of 1998)
OEMP	Operational Phase Environmental Management Programme
SDEMA	Specification Data Environmental Management
SPEC EMA	Specification Environmental Management

1 OVERVIEW

This document represents the Life-Cycle Environmental Management Programme (LEMP) for the proposed 132 kV transmission line adjacent to the existing Eskom transmission line from Longyuan Mulilo De Aar 2 North Wind Energy Facility to the Hydra Substation in De Aar, Northern Cape.

1.1 Purpose of the LEMP

The LEMP has been included in the Basic Assessment Report (BAR) in order to provide a link between the impacts identified in the Basic Assessment Process and the actual environmental management on the ground during project implementation and operation. The purpose of this document is to provide for environmental management throughout the various life-cycle stages of the proposed development. The following stages are included:

- Planning and design,
- Pre-construction and construction,
- Operation, and
- Decommissioning.

Furthermore, this LEMP aims for alignment and optimisation of environmental management processes with conditions of Environmental Authorisation that may arise, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

Note that this LEMP forms a 'living' document and hence allows for amendments throughout the lifecycle of the project, allowing for adjustments as new information is made available.

1.2 Legal requirements of Environmental Management Programmes

1.2.1 *The National Environmental Management Act, 1998 (Act No. 107 of 1998)*

In terms of the Environmental Impact Assessment (EIA) Regulations (Regulation R.543 of 18 June 2010) enacted in terms of the National Environmental Management Act (Act No. 107 of 1998, as amended) (NEMA), the proposed project triggers Activities 10, 11 and 18 of Regulation R.544 (18 June 2010), and Activity 13, 14 and 16 of Regulation R.546 (18 June 2010). As the proposed project triggers listed activities in terms of Regulations R.544 and R.546, it is necessary to submit a BAR for Environmental Authorisation (EA) to the Department of Environmental Affairs (DEA). Section 22 (l) of the EIA Regulations requires that a draft Environmental Management Programme (EMP) is submitted as part of the BAR.

The contents of the EMP must meet the requirements outlined in Section 24N (2) and (3) of NEMA (as amended) and Section 33 of the EIA Regulations. The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. The Department requires that the EMP be

submitted together with the BAR so that it can be considered simultaneously. Table 1 lists the requirements of an EMP as stipulated by Section 33 of the EIA Regulation R.543. Table 2 lists the requirements of an EMP as stipulated by Section 24N (2) and (3) of the NEMA.

Table 1: Section 33 of EIA Regulation R.543 listing the requirements of an EMP

33.	<i>A draft environmental management programme must comply with section 24N of the Act and include –</i>
(a)	<i>details of –</i>
	<i>(i) the person who prepared the environmental management programme; and</i>
	<i>(ii) the expertise of that person to prepare an environmental management programme;</i>
(b)	<i>information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of—</i>
	<i>(i) planning and design;</i>
	<i>(ii) pre-construction and construction activities;</i>
	<i>(iii) operation or undertaking of the activity;</i>
	<i>(iv) rehabilitation of the environment; and</i>
	<i>(v) closure, where relevant.</i>
(c)	<i>a detailed description of the aspects of the activity that are covered by the draft environmental management programme;</i>
(d)	<i>an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);</i>
(e)	<i>proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;</i>
(f)	<i>as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;</i>
(g)	<i>a description of the manner in which it intends to—</i>
	<i>(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</i>
	<i>(ii) remedy the cause of pollution or degradation and migration of pollutants;</i>
	<i>(iii) comply with any prescribed environmental management standards or practices;</i>
	<i>(iv) comply with any applicable provisions of the Act regarding closure, where applicable;</i>
	<i>(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;</i>
(h)	<i>time periods within which the measures contemplated in the environmental management programme must be implemented;</i>
(i)	<i>the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;</i>
(j)	<i>an environmental awareness plan describing the manner in which—</i>
	<i>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</i>
	<i>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;</i>
(k)	<i>where appropriate, closure plans, including closure objectives.</i>

The legislation hereby aims to ensure that effective environmental management is implemented throughout the life-cycle of the project via the translation of management actions identified in the Basic Assessment into the EMP.

The Department of Environmental Affairs & Development Planning (DEA&DP)'s *Guideline for Environmental Management Plans* (2005) aims to inform and guide the preparation and implementation of Environmental Management Plans/Programmes (EMPs). The guideline defines EMPs as:

“an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced”.

The guideline further provides “situations [that] could trigger the need for an EMP requiring authority approval”. One such trigger is:

“EMP’s covering specific activities assessed through an over-arching EIA and incorporated into a Strategic Environmental Management Plan. A tiered system of EIA leading to a [Strategic EMP] and multiple EMP’s may apply to large-scale complex developments with several sub-projects. In this case, an over-arching EIA may serve as the basis for environmental approval for the overall development. This may be supported by a [Strategic EMP] that is approved by the authorities. However, one or more EMP’s may be required for the specific activities that form part of the larger development”.

Table 2: Section 24N (2) and (3) of the NEMA listing the requirements of an EMP

<p>24N.(2) <i>the environmental management programme must contain-</i></p> <p>(a) <i>information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –</i></p> <p>(i) <i>planning and design;</i></p> <p>(ii) <i>pre-construction and construction activities;</i></p> <p>(iii) <i>the operation or undertaking of the activity in question;</i></p> <p>(vi) <i>the rehabilitation of the environment; and</i></p> <p>(vii) <i>closure, where relevant.</i></p> <p>(b) <i>details of –</i></p> <p>(i) <i>the person who prepared the environmental management programme; and</i></p> <p>(ii) <i>the expertise of that person to prepare an environmental management programme</i></p> <p>(c) <i>a detailed description of the aspects of the activity that are covered by the draft environmental management plan;</i></p> <p>(d) <i>information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);</i></p> <p>(e) <i>information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.</i></p> <p>(f) <i>as far as is reasonable practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and</i></p> <p>(g) <i>a description of the manner in which it intends to-</i></p> <p>(i) <i>modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</i></p> <p>(ii) <i>remedy the cause of pollution or degradation and mitigation of pollutants; and</i></p> <p>(iii) <i>comply with any prescribed environmental management standards or practices.</i></p> <p>(3) <i>the environmental management programme must, where appropriate-</i></p> <p>(a) <i>set out time periods within which the measures contemplated in the environmental management programme must be implemented;</i></p> <p>(b) <i>contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and</i></p> <p>(c) <i>develop an environmental awareness plan describing the manner in which-</i></p> <p>(i) <i>the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</i></p> <p>(ii) <i>risks must be dealt with in order to avoid pollution or the degradation of the environment.</i></p>

This LEMP aims to meet the EMP requirements as legislated by the NEMA Regulations as well as falling in line with the DEA&DP guideline document for Environmental Management Plans¹. It should however be noted that no guideline or guidance exists in terms of best practice approach to LEMPs. This document should thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

1.3 Structure of the LEMP

As discussed above, the LEMP aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. The LEMP has been structured to include the following sections:

¹ Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

1. Discussion summarising environmental management influencing the planning and design of the proposed project (Chapter 2);
2. Construction EMP based on identified impacts and mitigation measures from the BAR (Chapter 3);
3. Operational Framework based on identified impacts and mitigation measures from the BAR (Chapter 4);
and
4. Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure (Chapter 5).

1.4 Expertise of Environmental Assessment Practitioners

Section 33 of EIA Regulations and Section 24N (2) and (3) of NEMA requires that an EMP must include the details of the person(s) who prepared the EMP, and the expertise of that person to prepare an EMP. In this regard, the *Curriculum Vitae* of the Environmental Assessment Practitioners who compiled the LEMP are included in **Appendix A**.

2 PLANNING AND DESIGN PHASE

This section has been divided into subsections which outline how environmental considerations have informed, and have been incorporated into, the planning and design phases of the proposed transmission lines. Detailed design is usually undertaken as part of the pre-construction phase as it is a costly undertaking, which is generally only undertaken once all required authorisations have been obtained. Thus, the planning and design phases discussed are limited to those associated with the pre-authorisation phases. Mitigation measures have been recommended for the detailed design phase.

2.1 Project Description

Longyuan Mulilo De Aar 2 North (Pty) Ltd (Mulilo) has recently received preferred bidder status from the Department of Energy (DoE) under the third round of the Renewable Energy Independent Power Producers Programme (REIPPPP) for the construction of the approved 138.96 MW Longyuan Mulilo De Aar 2 North Wind Energy Facility (WEF) (hereafter referred to as North WEF), located within the Emthanjeni Local Municipality near De Aar, in the Northern Cape.

Mulilo proposes to construct a 132 kV overhead transmission line and associated infrastructure in order to connect the North WEF to the national transmission grid via the Hydra Substation.

The North WEF is located on the eastern plateau approximately 20 km east of De Aar, Northern Cape. The North WEF substation and metering station is located within the footprint of the North WEF on the farm Pienaars Kloof (Portion 6 of Farm 136). The 132 kV transmission line connects from the metering station and runs 21.46 km south-west traversing the farms Pienaars Kloof (Farm 136 – Portion 6 and Remainder of Portion 6), Slingershoek (Farm 2 – Remaining Extent and Portion 5), Maatjes Fountain (Farm 1 – Portion 3 and Portion 5 and Remainder of Portion 1 and Remainder of Portion 2), Carolus Poort (Farm 2 - Portion 3 and Portion 4 and Remainder of Portion 2), Wagt en Bittje (Farm 5 – Remaining Extent and Portion 3), Wag 'n Bietjie Annex B (Farm 139 - Remaining Extent) to the Hydra Substation (Farm 144 - Remaining Extent). Refer to **Figure 1** for a location map.

These farms are zoned for Agriculture and are currently used for grazing sheep, goats and cattle.

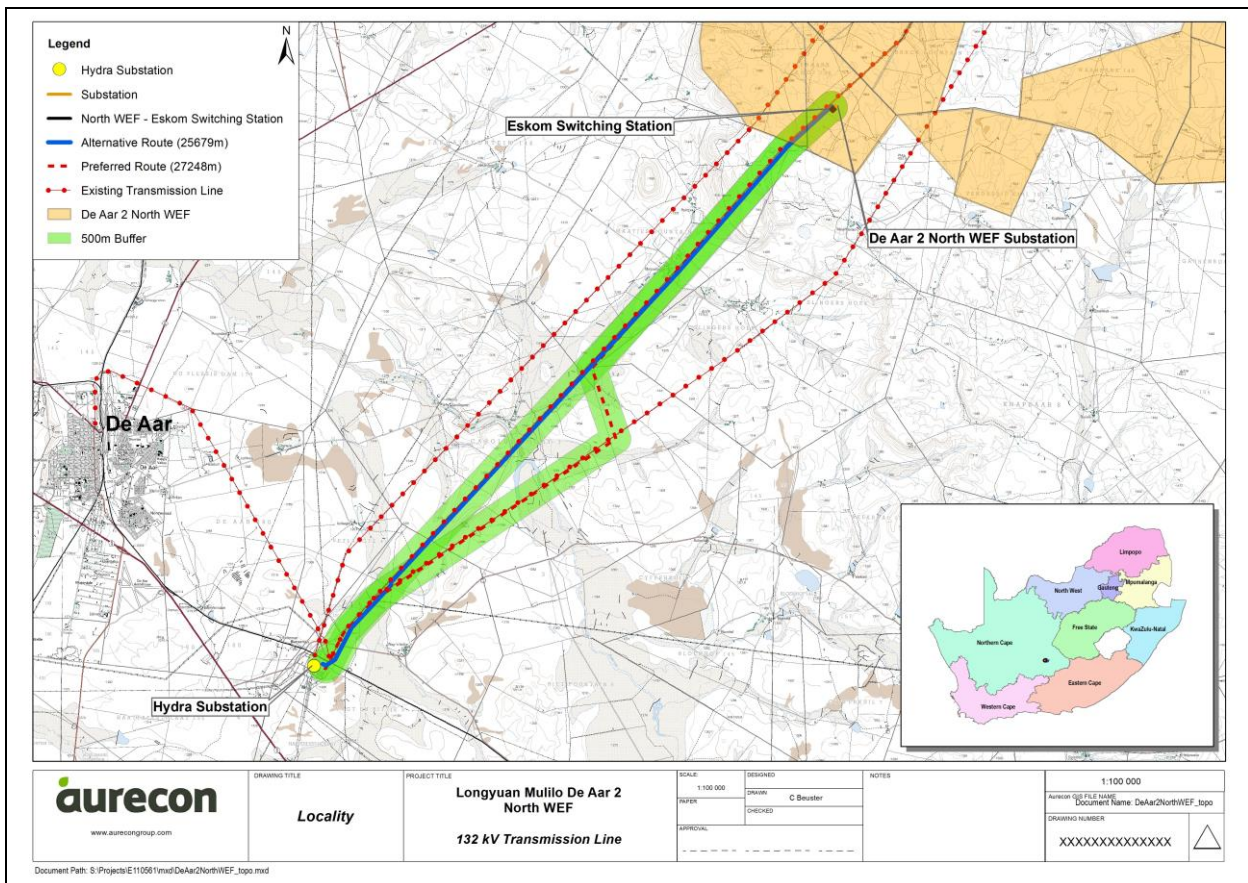


Figure 1: Location of the Longyuan Mulilo De Aar 2 North 132 kV Transmission Line Project

The onsite substation / control building will require a construction footprint of 100 m x 200 m (20 000 m³) in extent and will include a temporary construction yard and the switching / metering station. The construction yard will be used to house equipment and materials related only to the construction of the onsite substation / control building as well as an adjacent switching / metering station. The construction yard and switching station will each be 100 m x 100 m in extent, making up the total substation footprint area of 20 000 m³. From this switching/metering station, the 132 kV transmission line would be sited in parallel to the existing 400 kV Eskom transmission lines which traverses the site on route to the Hydra substation, located approximately 21.5 km south-west of the Northern WEF.

The proposed 132 kV transmission line to Hydra Substation would be a self-supporting structure or suspension pole along the straight sections of the power line, while a guyed intermediate or guyed suspension and angle strain structure would be used where there is a bend in the power line alignment. These monopoles vary in height from approximately 17.4 m to 21 m and the average span between two towers is 200 m, but can vary between 250 m and 375 m depending on the ground profile (topography) and the terrain to be spanned. The length of the proposed transmission line is approximately 21.5 km.

2.2 Project Alternatives Assessments

2.2.1 Switching/metering station

For technical reasons the switching / metering station has to be located adjacent to and within the footprint of the North substation / control building therefore, there is only one alternative location for the switching / metering station, i.e. the Preferred Alternative.

2.2.2 Route Determination

The route determination process included extensive screening and prefeasibility studies which were undertaken by a servitude specialist. Criteria considered during the route determination process include the following:

- 1 Geographical
 - a Topography, avoid steep or inaccessible areas;
 - b Avoid freshwater resources such as rivers, dams, flood plains and marshy areas;
 - c Follow existing farm boundaries;
 - d Avoid existing infrastructure (Buildings, cultivated lands, graveyards, irrigation systems and roads);
- 2 Minimise visual impacts;
- 3 Liaise with property owner's and establish their preferences in alignment;
- 4 Existing transmission lines, access and servitudes; and
- 5 Safety considerations and maintenance.

Specialists were required to access a corridor of 500 m as the final route of the transmission line would be determined based on the above factors.

2.2.3 Route (length)

Two route alternatives have been accessed:

- Alternative A transmission line (indicated in red on the locality map) is approximately 27 km in length from the North substation to the Hydra substation
- Alternative B transmission line (indicated in blue on the locality map) is approximately 25.5 km in length from the North substation to the Hydra substation and is a deviation from the Alternative A route.

2.2.4 Eskom grid connectivity and capacity

Extensive consultation with Eskom regarding grid connectivity and capacity for the proposed North WEF has been undertaken by Mulilo, and in combination of the project being awarded Preferred Bidder in the DoE's REIPPPP, there is a need to construct the 132 kV power line.

2.3 Summary of Alternatives

To summarise, the feasible alternatives assessed in the BAR include the following:

Site alternatives:

- Alternative A (preferred) transmission line route and associated infrastructure (including a switching / metering station and access roads)
- Alternative B transmission line route and associated infrastructure (including a switching / metering station and access roads).

Layout alternatives:

- Specialists have assessed a 500 m route corridor for both alternatives. This allows for minor realignment adjustments to be made based on sensitive features and areas that were identified. The final design of the route has been determined by incorporating the servitude maps and sensitive areas or features as identified by specialists. Geotechnical considerations for pylon (tower) positions would require a final survey and profiling to be undertaken in collaboration with Eskom. As such, the final location of pylon positions would only be finalised during implementation and would be dependent on approval as required by Eskom.

Activity alternatives:

- Transmission of Wind Energy;
- “No-go” alternative to Wind Energy transmission;

Technology alternatives:

- Single circuit Monopole 266; and
- Double circuit Monopole 277.

2.4 Design of the project

This section of the LEMP focuses on the design phase aspects. The terminology “design engineers”, as used below, refers to the consulting engineers, as well as the design team of the appointed Contractor that will finalise the design for construction. Requirements are presented as a simple bulleted list but are split into suggested and obligatory items.

2.4.1 Aspects to be considered in the design phase

The design engineers and the contractor’s design team have considered the following when finalising the route alignments:

- The proposed alignment has been designed to run in parallel with an existing transmission line;
- In general, the alignments have, as far as possible, followed existing gravel roads to minimise access track construction;
- The following have been avoided as far as possible to limit bird impact risks: (a) crossing steep slopes and cliffs, (b) crossing deep valleys, and (c) river and wetland crossings;

- Where possible, alignments have been moved lower into the plains to provide for reduced exposure and increased visual absorption capacity, as long as this suggestion does not result in the construction of additional access tracks;
- Where possible, alignments avoid sites where Red-Data listed species occur;
- Agriculturally significant areas and infrastructure have been avoided where possible for pylon footprints and cuts for access roads.

2.4.2 Aspects for implementation in the design phase

The design engineers and the contractor's design team shall implement the following when finalising the route alignments and line design:

- A horizontal configuration of bird flight diverters (BFDs) shall be specified for the 132 kV lines to limit bird electrocutions;
- The marking of overhead earth-wires with BFDs as per the specification of the avifaunal specialist.

Specifications for Bird Flight Diverters installation on a power line

Background:

Where there is a potential for bird collisions (especially rare or endangered species) with new overhead lines, or where actual collisions on existing lines have been recorded, it is advisable to install bird flappers or bird flight diverters on overhead transmission lines. It has been found in South Africa and internationally that the majority of collisions happen with the transmission lines, as they are thinner and less visible than the conductors. Typically, birds with large wingspans have less manoeuvrability, will see the conductors and when taking evasive action collide with the overhead transmission lines. The bird flappers or bird flight diverters are installed to make the transmission lines more visible thereby reducing the risk of collision.

Specifications:

According to the avifaunal specialist report (Appendix D) it is recommended that all the spans should be marked with BFDs on the earth wire of the line, ten metres apart, alternating black and white. Appendix B of the avifaunal specialist report indicates the preferred BFDs to be used.

These BFDs are typically 900 mm in length and 330 mm in height. For high voltage construction (greater than 40 kV), the diverters are used on the earth wire. Spacing distances are not critical and will depend on the local conditions however, a spacing of 10 m or 15 m is generally recommended.

The Endangered Wildlife Trust recommends that BFDs to be installed on transmission lines:

- should be on both earth wires 19/2.65 (this represents the conductor thickness of 19 strands 2.65 mm diameter, with both conductors on lattice structures) staggered; and
- should only be installed on the 60 % of the earthwire span, in the middle of the span and spaced at 10 m intervals. With typical 132 kV line span lengths of 250 m the 60 % marked section will amount to 150 m.

The figure below illustrates how the black and white spirals (BFDs) should be arranged and where they should be positioned (Figure 1) as per the EWT's recommendation.

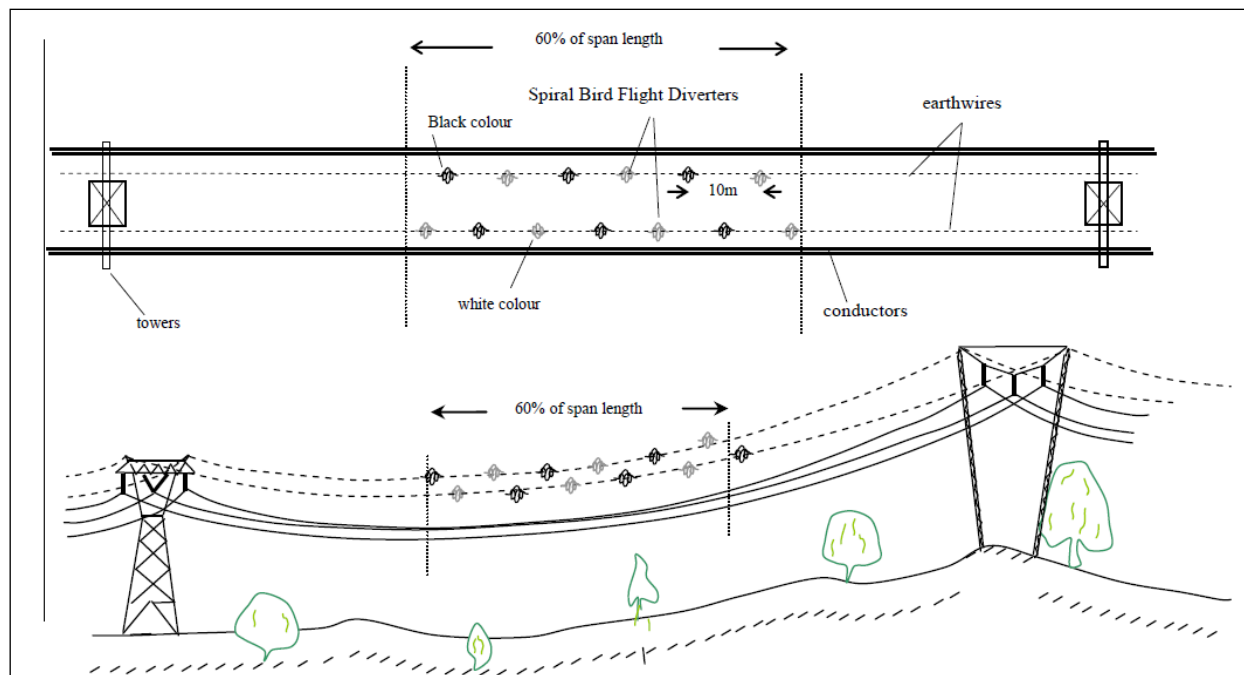


Figure 2: Illustration of Bird Flight Diverters by J Clara (Endangered Wildlife Trust) 19/10/2012

- Standard best practice international design protocols applicable to such lines shall be adhered to, including the specific requirement that a minimum clearance or buffer of 31 m be maintained for the 132 kV line (15.5 m in each direction);
- An anti-climbing barrier shall be provided at approximately 3 m height on each pylon footing of the 132 kV line;
- Substations shall be fenced and secured and standard warning signs provided;
- Graveyards and family ash heaps shall be avoided, and 132 kV pylons placed as far away as possible from such; and
- Animal kraals shall be avoided and 132 kV pylons placed as far away as possible.

The design for the proposed transmission lines should respond to the identified environmental constraints and opportunities. The following mitigation measures related to the design for the proposed transmission lines have been recommended to reduce the environmental impacts.

General:

No structures to be occupied or frequented by people shall be built within delineated servitude areas.

The design for the proposed transmission lines should respond to the identified environmental constraints and opportunities. Potential impacts as identified by the specialists have been categorised below and mitigation has been proposed to reduce the significance of negative impacts and enhance the positive ones over the lifecycle of the proposed project.

The potential impacts on the environment included:

Construction Phase impacts:

- Botany
- Avifauna
- Freshwater ecology
- Visual
- Agriculture
- Heritage resources, including Paleontological
- Socio-economic
- Transport
- Dust

Operational Phase impacts:

- Botany
- Avifauna
- Freshwater ecology
- Visual
- Agricultural
- Heritage resources, including Paleontological
- Socio-economic
- Economic (Energy Generation)
- Climate Change

The proposed mitigation measures provided below are to minimise and/or avoid the potential impacts of the transmission lines on the receiving environment and have been categorised below, relating the potential impact to specific specialists recommendation for avoidance or remediation. These measures encompass the lifecycle stages of the development, namely: construction, operational and potential decommissioning phases.

Mitigation measures during the construction phase

Botany

- Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the footprint of the tower structures, the servitude of the power line and switching station.
- Adjacent areas and service roads in the servitude must be properly maintained to avoid erosion impacts.
- Existing access roads must be used, where possible.

- If possible, place infrastructure (tower structures) a minimum of 30 m outside watercourses.
- Where possible, use existing roads as service roads. Service roads in the servitude must be properly maintained to avoid erosion impacts.
- If not possible to avoid watercourses, there is a legal obligation to apply for a Water Use Licence for any watercourses that may be affected, since they are classified in the National Water Act as a water resource.
- Disturbance of indigenous vegetation outside of the footprint of construction must be kept to a minimum.
- Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible.
- Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used.

Avifauna

- It is important that the construction activities, vehicle and pedestrian movement are restricted as much as possible to the actual servitude of the proposed power line. Maximum use should be made of existing roads.
- Vehicle traffic in and out of the area should be restricted to what is absolutely necessary for the construction process. This is especially important where the line crosses the escarpment, as this area is the most sensitive area as far as potential disturbance of breeding Verreaux's Eagles are concerned (see Figure 6).

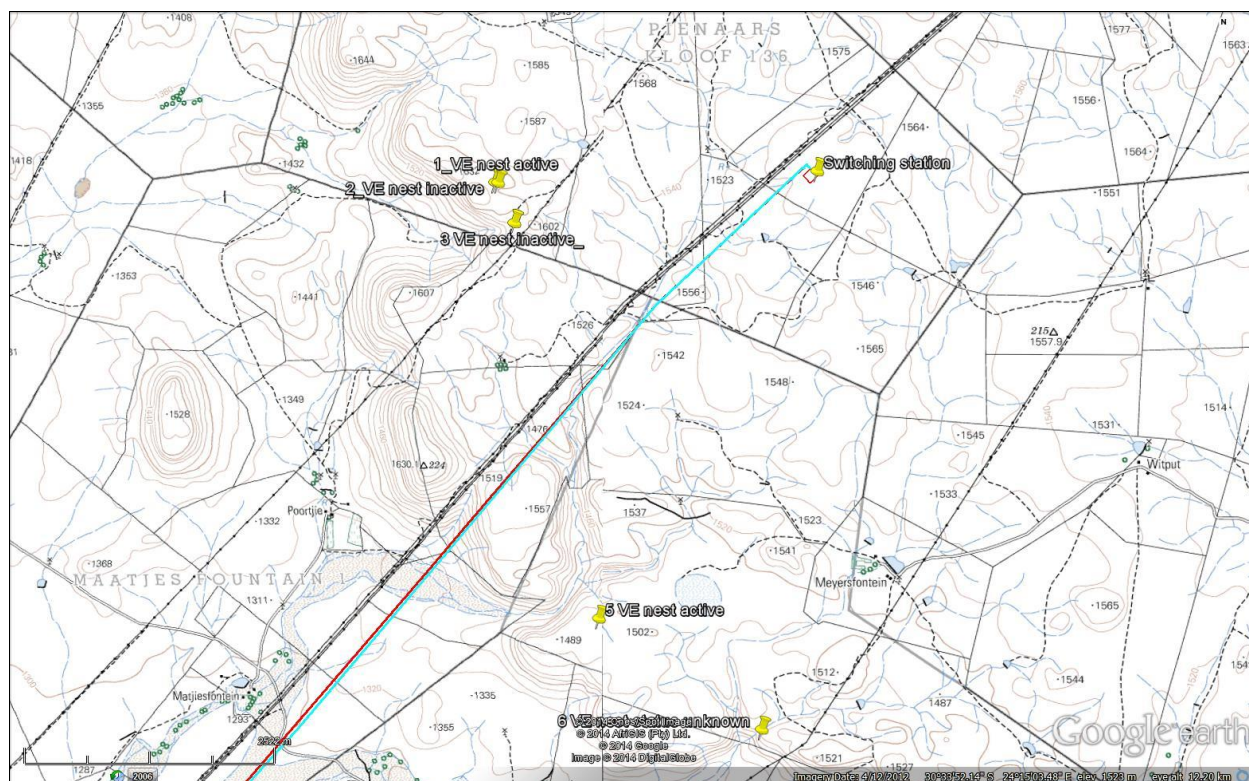


Figure 3: The location of Verreaux's Eagle nests along the escarpment, relative to existing power lines and the proposed 132kV line and switching station (blue and red lines).

- Immediately prior to construction commencing, an inspection should be conducted by the avifaunal specialist to record any large raptor nests on the existing transmission lines running parallel to the proposed 132 kV line, that could be impacted by the construction of the proposed line.

- Should any nests be recorded, it would require management of the potential impacts on the breeding birds once construction commences, which would necessitate the involvement of the avifaunal specialist, and the Environmental Control Officer. An effective communication strategy should be implemented whereby the avifaunal specialist is provided with a construction schedule which will enable him/her to ascertain when and where breeding Red Data raptors could be impacted by the construction activities. This could then be addressed through the timing of construction activities during critical periods of the breeding cycle, once it has been established that a particular nest is active.
- All the spans, except those spans that are located adjacent to two or more high voltage lines, should be marked with Bird Flight Diverters on the earth wire of the line, ten metres apart, alternating black and white. Appendix B of the Avifauna report indicates the preferred BFDs to be used.

Freshwater ecology

- The new line should be located as close as possible to the existing lines and the increase in the footprint of these lines within the floodplain should be minimised as far as possible.
- Due to the wide and erosive nature of the Brak River, the proposed transmission line should be located as far north of the river channel as possible and specifically downstream of the existing erosion control wall in the river.
- The existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project, specifically within the floodplain areas and stream channels.
- Where access routes need to be constructed within the stream channels, disturbance of the channels should be limited and all crossings within the drainage channels or stream beds should be such that the flow within the drainage channel is not impeded.
- Any disturbed areas should be rehabilitated to ensure that these areas do not become subject to erosion or invasive alien plant growth.
- To reduce the risk of erosion, particularly within the Maatjes Fountain tributary on the hill side of the plateau, any new access paths should be contoured along the steep slope or erosion protection walls constructed. Run-off over the exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion occurring within the freshwater features and drainage lines.
- It is recommended that there be minimal disturbance specifically within the river channel and that no poles/towers be placed within 30 m of the top of bank of the well-defined Brak and Maatjes Fountain river channels and 30m from the centre of the channel for the less defined stream crossings (Vet Laagte River and tributaries of the Maatjes Fountain River).
- Any contaminated runoff from the construction sites should be prevented from entering the rivers/streams.
- All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed.
- Construction workers should be given ablution facilities at the construction sites that are located at least 100 m away from the river/stream systems and regularly serviced. □ All crossings over drainage channels or stream beds after the construction phase should be rehabilitated such that the flow within the drainage channel is not impeded.
- Maintenance of infrastructure related to the project should only take place via the designated access routes.
- Disturbed areas along the access routes should be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.
- All crossings over drainage channels or stream beds after the construction phase should be rehabilitated such that the flow within the drainage channel is not impeded.

- These measures above should be addressed, implemented and monitored in terms of the Environmental Management Plan for the construction phase.

Heritage and Palaeontology

Archaeological mitigation measures

- The placement of the pylons must be done in such a way as to stay away from the structure;
- The site must be demarcated and a buffer of at least 10 meters kept, during construction.
- Because of subsurface and localised nature of archaeological remains, any deviation or changes within the corridor to the initial layout alignment will require an archaeological walkdown of the new alignment after pylons placement positions have been decided on to identify any possible archaeological and heritage structures and sites before construction commence.

Paleontological mitigation measures

- A Palaeontologist should be appointed as part of the Environmental Construction Team for preferably all identified paleontological sensitive areas but definitely for the identified high sensitive areas.
- If required, a paleontological rescue and/or destruction permit must be obtained by the Palaeontologist.
- The Palaeontologist accompanying the surveyor and foundation teams during the pylon construction phase should advise on pylon positions. If possible, pylons located within potential fossil bearing areas should be moved. If not possible, any fossils found should be rescued from the construction footprint.
- Compile a Phase 2 report for the Heritage Authority responsible after paleontological construction inputs.

Handling of chance finds

- A short induction on possible heritage resources that may be found in the area should be included in the induction program for construction employees.
- If a possible heritage site is discovered during construction activity, all operations in the vicinity of the discovery should stop and a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site, this can include initiating a grave relocation process, documentation of structures or archaeological excavations.

Mitigation measure applicable only if there are any changes to the initial layout

- Any deviation or changes to the initial layout will require an archaeological walkdown of the new alignment to identify any possible archaeological and heritage structures and sites before construction commence.

Visual

- The contract time should be kept to the minimum.
- Road junctions should have good sightlines and traffic control measures, signage and dust control measures should be provided.
- Implement measures as provided in the EMP, which includes procedures for dealing with dust pollution events including watering of roads, etc.
- Lay down areas and construction camp should have temporary screen fencing if necessary.
- Site offices, if required, should be limited to single storey and sited carefully using temporary screen fencing to screen from the wider landscape.
- Fires should not be allowed except at the construction camp and lay down areas

- No litter and/ or contaminants to be allowed to enter the environment, they should be taken to a licensed waste disposal facility.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and disposed regularly at licensed waste facilities.
- Utilisation of materials listed above should be controlled on site, especially in close proximity to the aquatic environment (Brak River).
- Transmission line layout: where there is a change in direction, a guyed suspension tower is recommended and along a straight route, a self-supporting tower. The visual impact of any of these proposed transmission routes could be moderated by keeping changes of direction to a minimum and increasing the span between towers to the practical maximum.

Agriculture

- Clearing activities should be kept to a minimum.
- In the unlikely event that heavy rains are expected, activities should be put on hold to reduce the risk of erosion.
- If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' months should be armoured with fascine like structures. A fascine structure usually consists of a natural wood material and is used for the strengthening of earthen structures or embankments.
- If earth works are required then storm water control and wind screening should be undertaken to prevent soil erosion.
- Interact with landowners to discuss where they would ideally like to see the power lines situated on their property.
- No pole structures are placed within drainage lines and their 10 meter buffer areas.

Impacts on socio-economic

- It is recommended that the local employment policy, as stated by the proponent, be implemented, audited and accompanied by a training programme. The policy must be based on a 'local's first' policy, specifically for low skilled jobs and should aim to recruit at least 20% of the jobs from the local community. This should also apply to all contracting firms.
- Implement a policy of "no employment at the gate" to prevent loitering.
- The site should be secured.
- A comprehensive employee induction programme would cover land access protocols and fire management. This was addressed in the LEMP.
- A comprehensive employee induction programme would address issues such as HIV/ AIDS and Tuberculosis, as well as alcohol and substance abuse. The induction should also address a code of behaviour for employees that would align with community values.
- The LEMP also addressed noise and dust control. A 24 hour system for receiving and addressing complaints should be established before the commencement of the construction phase. Local farmers and residents should be informed of the contact number.
- Housing has to be restricted to the approved laydown areas
- Source local businesses resources for supply, where possible.
- Compile relevant and clearly defined procurement standards to govern choices of suppliers, products and the methods and procedures that are to be used to communicate with pertinent suppliers. These standards need to be carefully defined and analysed by the applicant, for quality and sustainability purposes, as well as for monitoring and evaluation of the suppliers and service providers.

- Provide appropriate training, which would enable individuals to apply their skills to other construction and development projects in the region once construction is complete.
- Base recruitment on sound labour practices and keeping gender equality in mind.

Transportation

- Implement traffic control measures where necessary;
- Transport components overnight as far as possible; and
- Adhere to speed limits.

Dust

- Implement dust control measures identified in the CEMPr, which includes procedures for dealing with dust pollution events, include watering of roads, etc.

Mitigation measures during the operation phase

Botany

- An on-going monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.
- Any alien plants within the control zone of the company must be immediately controlled to avoid establishment of a soil seed bank. Control measures must follow established norms and legal limitations in terms of the method to be used and the chemical substances used.

Avifauna

- In the operation phase of the project, maintenance should be carried out in less sensitive time frames – e.g. outside of breeding seasons for the species sensitive to disturbance listed in Table 1 of Appendix D5.
- The new transmission line should be marked with bird flight diverters along its entire length and that all new power line infrastructure is adequately insulated and of a configuration that is bird friendly.

Freshwater ecology

- Maintenance of powerlines and associated infrastructure related to the project should only take place via the designated access routes.
- Disturbed areas along the access routes should be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.

Visual

- It is recommended that existing access roads and jeep tracks be used as far as possible for maintenance purposes.

Agriculture

- In the unlikely event that heavy rains are expected, maintenance activities should be put on hold to reduce the risk of erosion.

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- If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' months should be armoured with fascine-like structures. A fascine structure usually consists of a natural wood material and is used for the strengthening of earthen structures or embankments.
 - If earth works are required during maintenance, then storm water control and wind screening should be undertaken to prevent soil erosion.

Socio-economic

- It is recommended that the local employment policy as stated by the proponent is implemented, audited and accompanied by a training programme. The policy must be based on a 'local's first' policy, specifically for low skilled jobs and should aim to recruit at least 20% of the jobs from the local community. This should also apply to all contracting firms.
- It is recommended that the developer adopts a local procurement policy which would maximise the benefit to the local economy and minimise leakage.
- It is recommended that the developer forfills commitments under their REIPPPP bid agreement for Economic Development within the local community.

A map of the sensitive environmental features will be provided in **Figure 2.1 and 2.2** below in the Final report.

To be included in Final BAR

Figure 2.1 Map indicating environmental sensitivity areas, buffers for the proposed transmission line route.

To be included in Final BAR

Figure 2.2 Map indicating environmental sensitivity areas, buffers and the proposed layout.

3 COMPLIANCE MONITORING

Prior to the commencement of construction and operation of the project a suitably qualified and experienced Environmental Control Officer (ECO) shall be appointed by the proponent to ensure that the mitigation rehabilitation measures and recommendations referred to in the Environmental Authorisation (EA) are implemented, and to ensure compliance with the provisions of the LEMP, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

3.1 Roles and responsibilities

Client

Mulilo shall:

- Assume overall responsibility for the administration and implementation of the LEMP through an identified Project Manager or Engineer;
- Appoint or engage a suitably qualified Project Manager or Engineer; and
- Appoint or engage a suitably qualified independent ECO to:
 - monitor compliance with the LEMP;
 - undertake monthly, and close out, audits of compliance with the requirements of the LEMP; and
 - provide a copy of the audit reports to DEA and the Contractor.

Project Manager

The Project Manager or Engineer shall:

- Have overall responsibility for the protection of the environment;
- Have the authority to stop works and issue fines, as necessary;
- Receive reports from the ECO and shall report to Mulilo; and
- Support the ECO in his/her roles and responsibilities.

ECO

The role of the ECO will be to oversee and monitor compliance with and implementation of the construction phase EMP and Operational Phase EMP, which includes compliance with the relevant conditions contained in the EA. This includes the following responsibilities:

- i) Liaison with the Client, Project Manager or Engineer and DEA;
- ii) Monitoring of all of the Contractor's activities for compliance with the various environmental requirements contained in the Construction Specification;
- iii) Monitoring of compliance with the EA related to the construction phase as issued by DEA as well as other relevant environmental legislation;
- iv) Reviewing of the Contractor's environmental Method Statements;
- v) Ensuring that the requisite remedial action is implemented in the event of non-compliance;
- vi) Ensuring the proactive and effective implementation and management of environmental protection measures;
- vii) Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
- viii) Routine recording and reporting of environmental activities on a weekly and monthly basis; and
- ix) Recording and reporting of environmental incidents.

The duties of the ECO during operation phase will include:

- i) Liaison with the Client and DEA;
- ii) Monitoring of the operation of the project for compliance with the various environmental requirements contained in the EMP;
- iii) Ensuring the proactive and effective implementation and management of environmental protection measures; and
- iv) Monitoring of compliance with the EA related to the operational phase, as issued by DEA, as well as other relevant environmental legislation.

4 CONSTRUCTION PHASE EMP

The Construction EMP aims to address mitigation measures pertaining to the construction phase as identified during the course of the Basic Assessment. This section includes both General Specifications as well as Draft Specification Data, addressing general construction issues and issues that are not addressed by the General Specifications, respectively.

It should be noted that the Draft Specification Data should be revised as required post authorisation to ensure that all relevant conditions of the Environmental Authorisation (EA) have been addressed.

4.1 Construction EMP General Specifications

The comprehensive General Specifications have been included in **Appendix B** and include the following sections:

1	1 GENERAL	2.5.14	Disruption to existing and neighbouring land use activities
1.1	Scope	2.5.15	Temporary site closure
1.2	Definitions	2.5.16	Public roads
1.3	Normative References	2.5.17	Security and access control
1.4	Supporting Specifications And Legal Framework	2.5.18	Access routes / haul roads
1.5	Management And Administration	2.5.19	Housekeeping
1.5.1	Environmental Site Officer (ESO)	2.5.20	Ablution facilities
2	CONTRACTOR MOBILISATION AND GENERAL PROVISIONS	2.5.21	Recess areas and canteens
2.1	Baseline photography	2.5.22	Site clinic or first aid station
2.2	Method statements	2.6	Emergency procedures
2.3	Environmental Awareness	2.6.1.1	Fire
2.3.1	Environmental awareness training	2.6.1.2	Accidental leaks and spillages
2.3.2	Toolbox talks	2.7	Community relations
2.3.3	Construction personnel information posters	2.8	Construction Methods and procedures
2.4	Surveying and setting out	2.8.1	Site clearance
2.4.1	Site establishment	2.8.2	Demolition
2.4.2	Site fencing and demarcations	2.8.3	Cement and concrete batching
2.4.3	No Go Areas	2.8.4	Earthworks
2.5	Overarching environmental requirement	2.8.5	Dewatering
2.5.1	Protection of natural features	2.8.6	Bitumen
2.5.2	Protection of flora and fauna	2.8.7	Erosion and sedimentation control
2.5.3	Protection of archaeological and palaeontological remains	2.8.8	Crane operations
2.5.4	Noise control	2.8.9	Trenching
2.5.5	Lighting	2.8.10	Drilling and jack hammering
2.5.6	Fuel (petrol and diesel) and oil	2.8.11	Stockpiling
2.5.7	Contaminated water	2.8.12	Site closure and rehabilitation
2.5.8	Stormwater and drainage	2.8.13	Temporary revegetation of the areas disturbed by construction.
2.5.9	Solid waste management	3 COMPLIANCE WITH REQUIREMENTS AND PENALTIES	
2.5.9.1	Shutter oil and curing compound	3.1	Compliance
2.5.9.2	Bitumen	3.2	Penalties
2.5.9.3	Hazardous substances	3.3	Removal from site and suspension of Works
2.5.10	Workshop, equipment maintenance and storage	4 MEASUREMENT AND PAYMENT	
2.5.11	Materials handling, use and storage	4.1	Basic principles
2.5.12	Dust	4.1.1	General
2.5.13	Aesthetics		

4.1.2 All requirements of the environmental management specification

4.1.3 Work "required by the Engineer"

4.2 Billed items

4.2.1 Method Statements: Additional work

4.2.2 All requirements of the environmental management specification

4.2 Project Specifications

The following section provides the Draft Specification Data, which along with the General Specifications will be included in all contract documentation associated with the proposed project and will accordingly be binding on the Contractor.

Scope: The general principles contained within this Specification Data shall apply to all construction related activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

Interpretations: This Specification contains clauses specifically applicable and related to the environmental requirements for the proposed Longyuan Mulilo De Aar 2 North transmission line, near De Aar, Northern Cape.

Where any discrepancy or difference occurs between this Specification Data included in this EMP and the General Specifications included as an Appendix B, the provision of this Specification EMP shall prevail.

Definitions:

For the purposes of this Specification the following definitions shall be added:

- Works

Permanent works to be constructed and completed in accordance with the Contract.

- Working area:

The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpiles, batching areas, the construction area, all access routes and any additional areas to which the Engineer permits access. The construction footprint must be kept to a minimum.

4.3 Specification Data: Environmental Management (SDEM)

SDEM 4.3.1 Materials handling, use and storage (Subclause 2.4.11)

The Engineer shall be advised of the areas that the Contractor intends to use for the stockpiling of both natural and manufactured materials. No stockpiling shall occur outside of the working area (as designated by the engineer) and without the Engineer's prior approval of the proposed stockpiling areas. Imported material shall be free of litter, contaminants or exotic plant seed. The Contractor shall ensure that material is not stockpiled along the border of any water body (permanent or seasonal), including pans or within close proximity to no-go areas.

Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings. Stockpiles shall be stored under cover so as to prevent erosion and run off during rainy periods.

Topsoil (top 100 - 200 mm), from construction areas where vegetation clearing is required, shall be removed and stockpiled for rehabilitation purposes. This shall be spread over the top of the pylon foundation after the pylon has been erected and any other disturbed areas which are to be rehabilitated and seeded with indigenous species. Ground shall be returned as far as possible to original levels/gradients and any excess material shall not be left in piles, but shall be removed off-site.

Dust suppression measures shall be used particularly during dry periods of weather during the winter months.

All materials on the construction sites should be properly stored and contained. Storage of materials and builders' rubble shall be screened from public view.

Cut material shall be used, where possible in construction or on site (e.g. in grading gravel roads), or removed from site.

SDEM 4.3.2 Hazardous substances (Subclause 2.4.9.3)

Procedures detailed in the Materials Safety Data Sheets (MSDS) shall be followed in the event of an emergency situation. Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer.

An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage shall be implemented. This shall include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

Measures should include:

- Daily vehicle inspection to detect any leakages and or spillages.
- Weekly visual inspection of plant and standing equipment.
- Weekly visual inspection of fuel tanks.
- A record of these inspections needs to be kept to demonstrate compliance.
- The contractor needs to provide a method statement for "emergency procedures to deal with leakage and spillage of hazardous substances".
- Spill remediation kits shall be kept on site and all staff members shall be informed of where it is located.

SDEM 4.3.3 Shutter oil and curing compound (Subclause 2.4.9.1)

Shutter oil and curing compound shall be stored and dispensed within a bunded area, and not located closer than 32 m from the top of the river banks/water courses/drainage lines.

4.4 REQUIREMENTS

SDEM 4.4.1 Ablution facilities (Subclause 2.4.20)

A sufficient number of chemical toilets shall be provided by the Contractor in the construction camp area and at appropriate locations approved by the Engineer. Temporary/ portable toilets shall not be located within 100 m from river banks/water courses/drainage lines. Any septic tanks constructed for the project should be located at least 100 m (measured from top of bank) from the ephemeral streams and at least 1,000 m away from springs or any boreholes/wellpoints. The ratio of ablution facilities for workers shall not be less than that required by the Construction Regulations, 2014 of the Occupational Health and Safety Act. All temporary/ portable toilets shall be secured to the ground to prevent them from toppling due to wind or any other cause.

SDEM 4.4.2 Solid Waste Management (Subclause 2.4.9)

The contractor shall be required to prepare a method statement to indicate how and where general waste will be disposed of based on the following requirements:

Hazardous waste

- Hazardous wastes shall only be disposed at landfill sites registered for hazardous waste;
- Spills or leaks of construction hazardous materials including but not limited to concrete curing compounds, asphalt products, paints, petroleum products from equipment operation and maintenance, pesticides and herbicides shall be monitored and remediated immediately if detected.
- All hazardous waste materials must be carefully stored as advised by the ECO, and then disposed of at a licensed landfill site.
- No hazardous waste may be buried or burned under any circumstances.
- A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant.
- MSDS shall be available for all hazardous substances stored on site.
- Appropriate hazardous waste spill kits shall be available on site.
- An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical.
- Burying or burning of solid waste shall not be allowed.

General waste

- Regular disposal of general waste to registered landfill sites shall be required to prevent nuisance factors such as odours, vermin and flies. No burning of waste shall be allowed.
- Provide adequate waste bins.
- Set up system for regular waste removal to an approved landfill facility.
- Minimise waste by sorting wastes into recyclable and non-recyclable wastes, if practical.
- No waste may be buried or burned under any circumstances.
- A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site.
- Littering by the employees shall not be allowed under any circumstances.

- The ECO shall monitor the neatness of the work sites as well as the Contractor campsite.
- Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly to prevent vermin and odours.
- A certificate of disposal by shall be obtained the Contractor and kept on file, if relevant.

SDEM 4.4.3 Contaminated Water (Subclause 2.4.7)

The Contractor shall prevent the discharge of any pollutants, such as soaps, detergents, cements, concrete, lime, chemicals, hydrocarbons, glues, solvents, paints and wastewater into the surrounding terrestrial and aquatic environments. No discharge would be allowed and all contaminated soil, contaminated water and hazardous materials shall be disposed at a registered facility.

SDEM 4.4.4 Site Structures (Subclause 2.3)

No site structures shall be located within 32 m from river banks/water courses/drainage lines. Construction yards should be restricted in extent as far as possible and should be screened by visually impermeable material.

Ensure the camp is neat and tidy at all times. Site offices, if required, should be limited to single storey and should be sited carefully using temporary screen fencing to screen from the wider landscape.

Where site offices are required, these shall be limited to single storey and temporary screen fencing used to screen offices from the wider landscape.

SDEM 4.4.5 Noise control (Subclause 2.4.4)

Construction traffic shall be routed as far as practically possible from potentially noise sensitive receptors.

A good working relationship between the developer and all potentially sensitive receptors shall be ensured by establishing communication channels to ensure prior notice to the respective landowners if work is to take place close to them. Information that should be provided to the respective landowner includes:

- proposed working times;
- how long the activity is anticipated to take place;
- what is being done, or why the activity is taking place;
- contact details of a responsible person where any complaints can be lodged should there be an issue of concern.

When working within 500 m of a residence, the number of simultaneous activities (e.g. construction of access roads, foundations, etc) shall be limited to the minimum as far as possible. Furthermore, working time shall be co-ordinated with periods when the persons are not at home, where possible. An example would be to work within the 08:00 to 14:00 time-slot to minimize the significance of the impact because people are most likely at school or at work, minimizing the probability of an impact occurring.

Use of the smallest/quietest equipment for the particular purpose shall be considered.

- Ensure that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures;
- Ensure equivalent A-weighted daytime noise levels below 45 dBA at potential sensitive receptors;
- Ensure that maximum noise levels at potential sensitive receptors is less than 65 dBA;
- Prevent the generation of disturbing or nuisance noises, for example a transformer must be placed more than 200 m away from any house;
- Ensure acceptable noise levels (SANS guidelines) at surrounding stakeholders and potential sensitive receptors;
- Ensure compliance with the Noise Control Regulations;
- If any noise complaints are received, ensure noise monitoring is conducted at the complainant, followed by feedback regarding noise levels measured;
- Ensure the construction crew abide by the local by-laws regarding noise; and
- Ensure where possible construction work is undertaken during normal working hours (06H00 – 22H00; adopted from SANS 10103:2008.), from Monday to Saturday. If agreement can be reached (in writing) with the all the surrounding (within a 1 km) landowners, these working hours can be extended.

SDEM 4.4.6 Fuel (Petrol and Diesel) and oil (Subclause 2.4.6)

Fuels in the form of diesel and petrol shall not be stored within 32 m from any river banks/water courses/drainage lines.

SDEM 4.4.7 Equipment Maintenance and Storage (Subclause 2.4.10)

A designated area with an impermeable surface shall be available for the washing of equipment and vehicles. Wastewater generated from the washing of vehicles and equipment shall drain via an oil and water separator into a bunded area. The oil should be removed as required by a registered service provider to a register facility. The water accumulated in the bunded area can remain to be evaporated. If solids accumulate in the bunded area over time, it should be removed by a registered contractor and disposed of at a registered facility. Wastewater generated from construction activities or the washing of vehicles shall not be permitted to enter water courses, either directly or via a storm water system.

SDEM 4.4.8 Stormwater Erosion Control (Add Section 2.4.8)

A stormwater management plan shall be compiled and implemented. The plan shall ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan shall include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures shall promote the dissipation of storm water run-off. Establish the stormwater system as a priority, so that all runoff is led to the designated drainage from the site.

The Contractor shall take reasonable measures to control the erosive effects of stormwater runoff. Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted to limit the impacts of sediment deposition into the surrounding aquatic environment.

Run-off over any exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion occurring on the site and within the freshwater features and drainage lines. Contaminated runoff from the construction site(s) should be prevented from entering any rivers/streams.

SDEM 4.4.9 Method Statements (Subclause 2.2)

The following additional method statements shall be provided by the Contractor within 14 days of the receipt of the Letter of Acceptance and prior to the activity covered by the Method Statement being undertaken:

- Logistics for the environmental awareness course for all the Contractors employees.
- Emergency procedures for fire, accidental leaks and spillages of hazardous materials including:
 - who shall be notified in the event of an emergency, including contact numbers for the relevant local authority,
 - where and how any hazardous spills will be disposed of,
 - the size of spillage which the emergency procedures could contain, and
- Location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.
- Location and layout of the construction camp in the form of a plan showing offices, stores for fuels, hazardous substances, vehicle parking, access point, equipment cleaning areas and staff toilet placement.
- Location, layout and preparation of cement/concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water for such areas. An indication shall be given of how concrete spoil will be minimised and cleared.
- Method of undertaking earthworks, including spoil management, erosion, dust and noise controls.
- Method for the construction of access gates (Refer to Eskom CEMP).
- Management measures to be undertaken in instances where traffic flows may be interrupted.
- Extent of areas to be cleared, the method of clearing and the preparation for this clearing so as to ensure minimisation of exposed areas.
- Measures to be put in place during temporary closure periods, e.g. December holidays.
- Measures to be put in place to limit sediment deposition into the surrounding terrestrial and aquatic environment.

SDEM 4.4.9 Site Clearance (Subclause 2.7.1)

Removal of vegetation (uprooting) must be kept to a minimum. Only those areas where it is imperative to remove vegetation, i.e. construction areas, identified storage areas, roads and minor tracks should be cleared. If uprooting is required, the Contractor shall store the topsoil material and root material of cleared vegetation (top 100 - 200mm layer), for subsequent use during rehabilitation and re-vegetation. All other areas should remain vegetated. If brush-cutting is required as a minimum intervention, this should be applied with discretion; however, it would always be preferred to uprooting. If vehicle movement is required off designated roads and tracks, it would be advisable to drive over the shrubs (crush) rather than to uproot them. This would prevent loss of these shrubs since they would be able to regrow if not uprooted.

The Contractor shall not make use of herbicides or other chemical methods to clear the proposed site especially near the identified water courses. In order to limit erosion the Contractor shall retain original groundcover, as far as practically possible, adjacent to the aquatic environment and to the trenching line.

No infrastructure occurring along the intended route must be tampered with. Phone lines, railway lines need to be respected and kept out of harm's way. Any damages incurred due to construction activities are to be reported to the contractor and mitigated in consultation with the relevant authorities. All gates which are to be traversed need to be closed once used. Any damaged gates need to be repaired or replaced and reported to the relevant land owner.

SDEM 4.4.10 No go areas (Subclause 2.3.3)

All works to be undertaken shall be within the boundary of the site. A "no-go" area shall extend on either side of the working area i.e. all areas outside of the defined working area and designated access roads. The working area shall be demarcated in an appropriate manner determined by the Engineer.

Based on the ecological importance, all construction activities shall remain outside of all aquatic environments, with special efforts implemented to maintain a 32 m buffer between construction related activities and any rivers/water courses/drainage lines. These no-go areas shall stay in place until construction of the infrastructure within the buffer area must commence.

The recommended ecological sensitivity and buffer areas indicated in **Figure 1.1 and 1.2 (To be provided in the Final EMP)** shall be demarcated as "no-go" areas and construction activities shall remain outside these designated areas.

No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the Contractor must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager (Note: Where an electrical outage is required, at least fourteen work days are required to arrange it).

No equipment associated with earthworks shall be allowed outside of the site and defined access routes, or within "no-go" areas, unless expressly permitted by the Engineer.

SDEM 4.4.11 Protection of flora and fauna (Subclause 2.4.2)

No flora shall be removed or damaged, outside of the designated working area, without specialist botanical input. The collection of firewood by construction workers should be prohibited.

Any snakes found on site shall be removed from site and released into an area away from the site, without harm.

The contractor shall ensure that the time a trench is left exposed is kept to a minimum, and that open trenches are inspected on a daily basis for animals which may have fallen in or become trapped. Any animals found trapped in any trenches shall be freed without harm.

The Vegetation Specialist should be consulted to recommend species to be used in rehabilitation as well as any special measures for rehabilitation, such as shade-netting and alien vegetation removal. Restoration shall be

undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

Any of the cleared areas onsite that are not hardened surfaces shall be rehabilitated after construction is completed by re-vegetating the areas disturbed by the construction activities with suitable indigenous plants. Any disturbed areas shall be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.

Disturbance associated with the operation of the facility shall be minimised, by scheduling maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times – such areas will be identified during the pre-construction and operational monitoring.

SDEM 4.4.12 Protection of archaeological and palaeontological remains (Subclause 2.4.3)

The ECO shall be alert to the heritage sites within the site as well as the possibility of fossil remains being found either on the surface or exposed by fresh excavations during construction. Should substantial fossil remains be exposed during construction, these should be safeguarded by the ECO, preferably *in situ*, and the South African Heritage Resources Association (SAHRA) should be notified by the ECO so that appropriate mitigation can be undertaken.

In the case of unexpected exposure of below-ground archaeological or fossil material during excavations, SAHRA and Northern Cape Heritage Authorities Ngwao Boswa Kapa Bokoni must be consulted immediately to ensure timeous implementation of appropriate mitigation measures. In the event of accidental uncovering of graves, work must stop immediately and the SAHRA Burials Unit must be notified. An archaeologist or palaeontologist shall be involved to assist with the investigation and procedures to address the situation.

SDEM 4.13 Access routes/ haul roads (Subclause 2.4.18)

Eskom's rights and services shall be acknowledged and respected at all times. Unobstructed access shall be granted to Eskom to access their servitudes. Existing access roads will be used as far as practicably possible. Where no access roads exist, jeep tracks will be used to access the servitudes. All existing access roads shall be kept tidy.

The contractor shall ensure that all regulations relating to traffic management are observed and local traffic officials are informed of the proposed construction activities. As far as possible, attempts shall be made to ensure that high construction related road usage coincides with low traffic flow periods.

Signage and safety measures on access roads shall comply with the guidelines as set out in the latest issue of the SADC Road Traffic Signs Manual. Standard "construction ahead" warning signs should be placed on all relevant roads in the area. Ensure access roads are kept clean and storage of materials is screened.

A traffic management plan for the site access roads shall be compiled and implemented to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan shall include measures to minimize impacts on local commuters, e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

Access gates:

- The Landowners shall be kept abreast of all developments and shall be kept informed about the progress and phases of the contract.
- All gates shall be fitted with locks and be kept locked at all times during the construction phase.
- Gates shall only be left open on request of the Landowner if he accepts partial responsibility for such gates in writing, once the Contractors have left site and the gates are fitted with Eskom locks. Such gates shall be clearly marked by painting the posts green.
- All claims arising from gates left open shall be investigated and settled in full by the Contractor.
- If any fencing interferes with the construction process, such fencing shall be deviated / protected until construction is completed.
- All gates installed in electrified fencing shall be re-electrified.
- The Environmental Control Officer shall approve gate positions.
- All gate positions shall be three (3) metres off centre to allow for continued access when stringing takes place.

Servitude jeep tracks / existing access roads:

- A physical access plan along the servitude shall be compiled and the Contractor shall adhere to this plan at all times.
- Proper planning when the physical access plan is drawn up by the ECO in conjunction with the Contractor shall be necessary to ensure access to all tower sites.
- All access jeep tracks/roads will be marked.
- Agreed on Access to be used at all times.
- No illegal use of private roads during construction due to damage anticipated as a result of heavy vehicles and equipment.
- All existing private access roads used for construction purposes, shall be maintained at all times to ensure that the local people have free access to and from their properties.
- Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect.
- Upon completion of the project all roads shall be repaired to their original state.
- No roads shall be cut through river and stream banks as this may lead to erosion causing siltation of streams.
- All structures constructed for access purposes shall be properly designed and drawings of such structures shall be available for record purposes.
- Permanently wet areas are shown on the profiles. No vehicular traffic shall be allowed in such areas.
- Only existing roads through such areas may be used with the approval of Eskom and the Landowner.
- No equipment shall be used which may cause irreparable damage to wet areas. The contractor shall use alternative methods of construction in such areas.
- Ensure that all drivers are aware of the "no-go" areas, permissible roads, and where the offloading area is.
- Impose speed limits on the construction site.
- Manage site access to prevent congestion of vehicles and trucks.
- Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.
- Roads not to be used shall be marked with a "NO ENTRY for construction vehicles" sign.
- Access roads are to be kept litter free.

- Transportation of materials must be done by the least amount of trips to prevent the construction vehicles from congesting the main roads leading to De Aar.
- The contractor must ensure that there is ample space to off load the materials to prevent truck being delayed and interrupting the traffic flow.

SDEM 4.14 Cement and concrete batching (Subclause 2.7.3)

No cement and/or concrete batching shall occur within the “no-go” areas or within 32 m from any river banks/watercourses/drainage lines. Reasonable measures shall be implemented to limit contaminated surface run-off into the surrounding vegetation.

SDEMA4.15 Earthworks (Subclause 2.7.4)

Any blasting is to be executed by a suitably qualified person. Controlled blasting techniques shall be employed to minimise dust and fly rock during blasting.

The use of explosives of any type within 500 m of Eskom's services shall only occur with Eskom's prior written permission. If such permission is granted the Contractor must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.

Prior to blasting, the Contractor shall notify the relevant occupants/ owners of surrounding land and address any concerns. Buildings within the potential damaging zone of the blast shall be surveyed preferably with the owner present, and any cracks or latent defects pointed out and recorded either using photographs or video. All Local Authority regulations are to be adhered to and all service infrastructures are to be located prior to commencement of blasting activities.

Blasting or drilling shall take place during normal working hours. The Contractor shall notify emergency services, in writing, a minimum of 24 hours prior to any blasting activities commencing on site. Adequate warning must be issued to all personnel on site prior to blasting activities taking place. All legally required signals are to be clearly indicated. The Engineer shall be issued daily updates of the days intended blasting activities.

The Contractor shall prevent damage to special features and the general environment, which includes the removal of flyrock. Damage caused by blasting / drilling shall be repaired to the satisfaction of the Engineer.

Minimise areas disturbed at any one time and protect exposed soil against wind erosion, e.g. by dampening with water or covering with hessian.

Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances with respect to existing powerlines onsite. Clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated in terms of Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) at all times.

SDEM 4.4.16 Community relations (Subclause 2.6)

Maintain a register that shall contain details of the measures taken to resolve complaints and the details of the communication of these measures to the person who raised the complaint.

SDEM 4.17 Erosion and sedimentation control (Subclause 2.7.7)

Where necessary, sedimentation barriers shall be laid between the Work Area and the “no-go” areas to limit sediment deposition. The sedimentation barrier shall consist of a geotextile fabric stretched across and attached to supporting posts and stabilised with sandbags. The barrier shall be inspected daily and any damage shall be repaired immediately. Sediment deposits shall be removed once they reach half the height of the barrier.

Construction activities should be, as far as possible, limited to the identified sites for the proposed transmission line and the identified access routes. Where jeep tracks need to be constructed through ephemeral streams, disturbance of the channel should be limited.

Clearing of debris, sediment and hard rubble associated with the construction activities should be undertaken post construction to ensure that flow within the drainage channels is not impeded or diverted. Rehabilitate disturbed stream bed and banks and revegetate with suitable indigenous vegetation. Should any erosion features develop, they should be stabilised as soon as possible.

SDEM 4.18 Site closure and rehabilitation (Subclause 2.7.12)

All construction debris found within the disturbed areas shall be removed and disposed of at a registered landfill site.

The Vegetation specialist shall recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal. The construction footprint associated with the activity shall be re-vegetated with indigenous vegetation, as directed by the specialist. Disturbed areas shall be rehabilitated as soon as possible after construction.

Vegetated areas should preferably be watered if planted in the dry season to aid the establishment of plants; alternately rehabilitation should take place in the wet season; or as agreed with the vegetation specialist.

SDEM 4.19 Labour requirements

Recruitment shall be based on sound labour practices and with gender equality in mind. Obtain a list of locally available labour and skills. Preference shall be given to local communities.

Appropriate training shall be provided to enable individuals to apply their skills to other construction and development projects in the region once the construction phase is completed.

SDEM 5 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

SDEM 5.1 Penalties (Subclause 3.2)

Stop works orders will be issued for the transgressions listed below. Stop works orders may be issued per incident at the discretion of the Engineer.

- a) Any employees, vehicles, plant, or thing related to the Contractor's operations operating within the designated boundaries of a "no-go" area.
- b) Any vehicle driving in excess of designated speed limits.
- c) Persistent and unrepaired oil leaks from machinery.
- d) Persistent failure to use, monitor and empty drip trays timeously.
- e) The use of inappropriate methods for refuelling.
- f) Litter on site associated with construction activities.
- g) Deliberate lighting of illegal fires on site.
- h) Employees not making use of the site ablution facilities.
- i) Failure to implement specified noise controls
- j) Failure to empty waste bins on a regular basis.
- k) Inadequate dust control.
- l) A spillage, pollution, fire or any damage to any watercourse/ wetland resulting from negligence on the part of the Contractor.
- m) Any act, that in the reasonable opinion of the Engineer, constitutes a deliberate contravention of the requirements of these Specifications

The Engineer will determine what constitutes a transgression in terms of this clause, subject to the provisions of Clause 57(1) of the General Conditions of Contract. In the event that transgressions continue the Contractor's attention is drawn to the provisions of Sub-clause 55(1) of the General Conditions of Contract 2004 under which the Engineer may cancel the Contract.

5 OPERATIONAL FRAMEWORK EMP

The information is summarised in tabular format illustrating the activity, aspect, impact, mitigation measure, performance indicators, resources, schedule and verification. These criteria are listed and explained below:

The following components are identified/ described:

- **Activity:** component/activity of the project for which the impact has been identified;
- **Aspect:** the aspect of the above activity which will be impacted;
- **Impact:** the environmental impact identified and to be mitigated;
- **Mitigation measure:** measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
 - **Objective:** desired outcome of mitigation measure,
 - **Mechanism:** method of achieving the objective;
 - **Performance indicators:** outcomes that will indicate achievement of objective/s;
 - **Responsibility:** party or parties identified for implementation of mitigation measure/s;
 - **Resources:** available resources to aid implementation of mitigation;
 - **Schedule:** timeframe in which identified impact and mitigation measure is anticipated to occur; and
 - **Verification:** party or parties identified as responsible for review and assessment of final outcome.

This section contains the Operational Framework EMP table which constitutes the Operational Framework EMP. It is important to note that this Framework EMP has been compiled prior to authorisation of the proposed project and will be updated to include the conditions of the EA that will be issued by DEA as part of the EA.

Operational Framework Environmental Management Programme Table

NO.	ACTIVITY	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	RESOURCES	SCHEDULE	VERIFICATION
1.	All Activities	Environmental management documentation and procedures	No framework within which to locate the management of the operational phase. No procedures against which to assess environmental performance during the operational phase and thus no measure of compliance.	Objective: To ensure that the operation of the transmission lines does not result in avoidable impacts on the environment, and that any impacts that do occur are anticipated and managed. Mechanism: 1) Appoint a suitably qualified ECO to monitor compliance (either independent or in-house). 2) Audit the compliance with the requirements of the environmental specification contained within the OEMP.	Environmental impacts effectively monitored and managed during the operational phase. Comprehensive record of compliance and remedial actions available to Mulilo and the authorities.	ECO Mulilo	OEMP	Twice in the first three years and then once every five years	Mulilo DEA
2.	Operational Activities	Protection of the surrounding environment (aquatic and terrestrial)	Effects that the operation and maintenance of the transmission lines would have on the surrounding environment (including avifauna)	Objective: To ensure that impacts on the surrounding biophysical environment are minimised during the operational phase. Mechanism: 1) Maintenance should be carried out in less sensitive time frames – e.g. outside of breeding seasons for the species sensitive to disturbance listed in Table 1 of Appendix D5 of the Draft BAR. 2) The new transmission line	No dead birds are found on site.	ECO Avifaunal Specialist Mulilo	Environmental Management Procedures OEMP	Bird diverters be implemented before commissioning of lines and checked during routine maintenance of the lines	Mulilo DEA

Operational Framework Environmental Management Programme Table

NO.	ACTIVITY	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	RESOURCES	SCHEDULE	VERIFICATION
				should be marked with bird flight diverters along its entire length and that all new power line infrastructure is adequately insulated and of a configuration that is bird friendly.					
3.	All Activities	Protection of the surrounding environment (aquatic and terrestrial)	Effects that the operation and maintenance of the transmission lines would have on the surrounding environment (including local flora, fauna, avifauna and watercourses around the proposed development).	<p>Objective: To ensure that impacts on the surrounding biophysical environment are minimised during the operational phase.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) During maintenance activities limit movement to disturbed areas. 2) Limit operational activities as far as possible to the delineated site footprint and access routes. 3) Any areas disturbed during maintenance should be rehabilitated. 4) Ensure compliance with applicable regulations and prevent increased soil erosion. 5) Should any erosion features develop, they should be stabilised as soon as possible. 6) Consultation with the 	The surrounding environment including aquatic and terrestrial ecology is not impacted on.	ECO Mulilo	Environmental Management Procedures OEMP	As maintenance is required on site.	Mulilo DEA

Operational Framework Environmental Management Programme Table

NO.	ACTIVITY	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	RESOURCES	SCHEDULE	VERIFICATION
				vegetation specialist and implementation of the recommended alien invasive control measures and re-vegetation measures during rehabilitation.					
4	All activities	Security and farming practices	Impact of the proposed servitude on security and farming practices	<p>Objective: To ensure that the maintenance of the transmission lines does not negatively affect the security on the farm nor does it have an impact on farming practices and loss of animals.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1. Farm gates should always to secured. 2. Livestock should not be allowed to leave the property. 3. Speed limits (40Km/h) for driving on access roads must be adhered to. 4. Locks on service gates should be installed to prevent unauthorised access. 					
5.	All Activities	Visual aesthetics	Impact of the proposed development on the surrounding visual aesthetics of the area	<p>Objective: To ensure that impacts on the visual aesthetics are minimised during the operational phase.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) During operation, the maintenance of the 	Condition of the project infrastructure and roads.	Eskom	Environmental Management Procedure OEMP	As required based on annual inspections of the project	Mulilo DEA

Operational Framework Environmental Management Programme Table

NO.	ACTIVITY	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	RESOURCES	SCHEDULE	VERIFICATION
				transmission line servitude, the internal roads, and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact.					

6 DECOMMISSIONING

6.1 Decommissioning of the proposed transmission lines

The transmission infrastructure which would be utilised for the proposed project is expected to have a lifespan of approximately 20 years (with maintenance), similar to the De Aar 2 North Wind Energy Facility (WEF).

The WEF generally have a power purchase agreement (PPA) of 20 years signed with the energy buyer, namely the Department of Energy (DOE). After the PPA comes to an end, the PPA may be renegotiated at terms that are financially viable at that point in time. The PPA may be based on a shorter term agreement using the existing turbines (if the existing turbines are still suitable) or a longer term PPA may be negotiated based on re powering (refurbishment) of the proposed wind energy facility. It is most likely that refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time. New turbine technology may also reduce potential environmental impacts.

Where no new PPA can be negotiated it is likely that the wind farm would be decommissioned according to requirements in the EMP and as required by any other legislation/regulations at that time.

Should the WEFs be decommissioned it is likely that the transmission servitudes would not be required and as such would also be decommissioned.

The following decommissioning and/or repowering activities have been considered to form part of the project scope of the proposed transmission lines:

6.1.1 Site preparation

Site preparation activities would include confirming the integrity of the access to the site to accommodate required equipment and lifting cranes, preparation of the site (e.g. construction areas) and the mobilisation of decommissioning equipment.

6.1.2 Disassembly of transmission lines

After disassembling, the tower components would be reused, recycled or disposed of in accordance with regulatory requirements. The land-use would revert back to agriculture/ grazing.

6.2 Way Forward

If the transmission lines are decommissioned then the sites would be fully rehabilitated in accordance with requirements in terms of relevant legislation such as the National Environmental Management Act. All roads would be left on site, as it would assist the farmer in accessing his land, unless the farmer requires otherwise.

7 CONCLUSION

In conclusion it should be noted that the LEMP should be regarded as a living document and changes should be made to the LEMP as required by project evolution, while retaining the underlying principles and objectives on which the document is based.

The compilation of the LEMP has incorporated impacts and mitigation measures from the EIR as well as incorporating principles of best practice in terms of environmental management. By identifying the potential impacts, mitigation measures, performance indicators, responsibilities, available resources, potential schedule and verification responsibility, the LEMP has provided a platform on which both the construction phase and the operational phase EMPs can be founded. The LEMP has ensured that the individual EMPs will be able to incorporate mitigation measures based on the project in its entirety as opposed to phase-specific measures.

APPENDIX A
CURRICULUM VITAE OF
ENVIRONMENTAL ASSESSMENT
PRACTITIONERS

APPENDIX B
CONSTRUCTION EMP GENERAL
SPECIFICATIONS (COMPREHENSIVE)
