
PROPOSED KORANA WIND ENERGY FACILITY, LOCATED NEAR POFADDER IN THE NORTHERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

November 2019

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

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

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Department/ the competent authority: Refers to the Department of Environmental Affairs.

Development footprint: in respect of land, means any evidence of its physical transformation as a result of the undertaking of any activity.

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

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

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

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

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

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

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

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

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

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

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

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

Environmental management inspector: A person designated as an environmental management inspector in terms of Section 31B or 31C on the National Environmental Management Act 107 of 1998.

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

Generator: The generator is what converts the turning motion of a wind turbine's blades into electricity.

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

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

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

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

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

Nacelle: The nacelle contains the generator, control equipment, gearbox, and anemometer for monitoring the wind speed and direction.

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

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

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

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

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

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

Tower: The tower, which supports the nacelle to which the rotor is attached, is constructed from tubular steel or concrete. It is approximately 80 m to 140m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 80 to 140 m tall. The tower must be strong enough to support the nacelle and blades, and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Waste: Is defined as follows:

- a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or
- b) disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or
- c) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste.

Wind power: A measure of the energy available in the wind.

Wind speed: The rate at which air flows past a point above the earth's surface.

ABBREVIATIONS AND ACRONYMS

DEA	National Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EO	Environmental Office
GG	Government Gazette
GN	Government Notice
Ha	Hectare
I&AP	Interested and Affected Party
km ²	Square kilometres
kV	Kilovolt
m ²	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
PM	Project Manager
SHE	Safety, Health and Environment
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited

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CHAPTER 1: PROJECT DETAILS

1.1. Overview of the Proposed Project

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing the establishment of a commercial wind energy facility and associated infrastructure on an identified site located near Pofadder in the Northern Cape Province of South Africa. The proposed site is located within the Khai-Ma Local Municipality. Pofadder situated approximately ~21 km north-north-east of the study area while Aggeneys is ~38 km to the north-west. This proposed project will be referred to as the **Korana Wind Energy Facility**.

The Korana Wind Energy Facility study area (~46.87 km² in extent) is proposed to be located on the following farm portions:

- » Portion 1 of the farm Poortje 209;
- » Remainder of the farm Poortje 209; and
- » Portion 1 of the farm Namies Suid 212.

Infrastructure associated with the **Korana Wind Energy Facility** as per the issued EA includes will include the following:

- » 70 wind turbines;
- » Turbine foundation/footprint (20m x 20m);
- » Cabling between turbines to be laid underground (1-2m deep) along the road verge where practical to connect to an on-site substation;
- » Laydown area (footprint (50m x50m));
- » A 400 kV substation and a satellite 132 kV substation to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site or collector substation;
- » Hardstand area adjacent to each turbine;
- » Internal access roads;
- » Workshop area for maintenance and storage; and
- » Permanent wind monitoring masts.

1.2. Conclusions and Recommendations of the EIA

This EMPr has been developed based on the findings of the Environmental Impact Assessment (EIA) (Savannah Environmental, 2015), and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

The construction of the Korana Wind Farm will lead to permanent disturbance of an area of approximately 46 km² in extent (i.e. 2.9% of the site). Permanently affected areas include the turbine footprints and associated infrastructure, as well as the internal underground internal connection cable routes and the internal access roads. From the specialist investigations undertaken for the proposed wind energy facility development site, it was concluded that the majority of impacts identified through the EIA are of

moderate to low significance with the implementation of appropriate mitigation. Limited areas of potential high sensitivity were identified (refer to the sensitivity map - Figure 1.1). These potentially sensitive areas and general EIA findings include:

- » **Ecology:** The major sensitive features of the site are the drainage lines. The principle mitigation should be avoidance of identified sensitive areas, i.e. seasonal drainage lines and any quartzite koppies. No protected trees were recorded in the study area. However, natural vegetation will be impacted, which would require a permit from Northern Cape Department of Environment and Nature Conservation (DENC).
- » **Freshwater ecosystems:** The proposed layout of the project area will have a negligible impact on the aquatic environment. This is based on the assumption that no infrastructure will be placed directly within any active channels.
- » **Bat sensitive areas:** Potential roosting sites are present along several drainage lines and rocky elevations found throughout the proposed study site. These areas often have favourable weather conditions which cause increases in insect abundance and thus possible increases in bat activity. Based on the final layout recommended within the EIA, two turbines are currently located within the bat high sensitivity areas and their respective buffers.
- » **Bird Habitat and Sensitive Areas:** Due to the overall low flight activity recorded on site, the collision risk index that was developed for the site highlighted very limited spatial patterns in flight activity. No turbine re-positioning is recommended as a result of the collision risk index. The significance of impacts on avifauna as a result of habitat destruction, disturbance of birds, and displacement of birds is rated as medium significance. Collision of birds with turbines is rated as low significance. Site sensitivity mapping has identified buffers around water points. Based on the final layout recommended in the EIA, no turbines are currently located within these no-go areas.
- » **Noise sensitive receptors (NSRs):** Noise sensitive receptors do occur in and around the site. The significance of the noise impact is considered to be of a low significance for all Noise Sensitive Developments.
- » **Visual receptors:** The wind turbines would likely be exposed to a number of farm residences and sections of secondary roads traversing near or over the development site. It is envisaged that the structures (where visible from shorter distances) may constitute a high visual prominence, potentially resulting in a high visual impact.

No construction housing will be established on the site, and construction workers will be housed in the towns of Pofadder, or other available/existing accommodation. Construction activities on the site will be restricted to daylight hours. The construction phase is anticipated to extend over approximately 18 - 24 months. Negative impacts on the social environment during construction relate mainly to impacts due to presence of construction workers and visual impacts imposed by the facility on the local environment. With the implementation of the recommended mitigation measures, negative impacts will be reduced to be of medium to low significance, and are therefore considered acceptable.

There will be a positive impact due to employment creation, which is a much needed relief by the Khai-Ma Local Municipality (which has high unemployment levels). The positive impact due to employment creation will be lower during operation as there will be a limited number of staff required compared to the construction phase. The potential negative social impacts of the proposed development are offset by the potential positive impacts. With the implementation of the recommended enhancement measures, positive impacts will be of medium to high significance, and are therefore considered acceptable.

1.3 Conclusions of the EA Amendment Process

In terms of Avifaunal Impacts, new guidelines have become available subsequent to the original assessment and has made a difference to the buffer implemented around a Martial Eagle nest. A 4.5km buffer was implemented around this nest, which is considered a no-go area for turbines. One impact has increased in significance due to the proposed amendment, however, the impact rating after the implementation of new mitigation measures remains the same. The avifaunal specialist recommended post-construction monitoring for the first three years of operation, and then repeated again in year 5, and again every five years thereafter. The exact scope and nature of the post-construction monitoring must be informed on an ongoing basis by the result of the monitoring through a process of adaptive management. The avifaunal specialist recommended that the number of turbines be reduced from the approved 70 turbines to 42 turbines, and that no more than 13 turbines be placed between 4.5km and 6km of the Martial Eagle nest.

The Bats specialist concluded that two impacts would increase with the proposed amendment but with the implementation of new mitigation measures the impact rating after mitigation will remain the same. The bats specialist recommended adhering to buffers of 300 m and 500 m around potential roost sites (in accordance with the bat monitoring previously conducted) and that the turbine layout should be approved by a bat specialist upon finalisation of turbine specifications. The bats specialist also recommended a reduction in turbines to a maximum of 42 turbines. In terms of aspects relating to visual and noise, the proposed changes to the EA will not increase the significance of impacts originally identified in the EIA report or lead to any additional impacts.

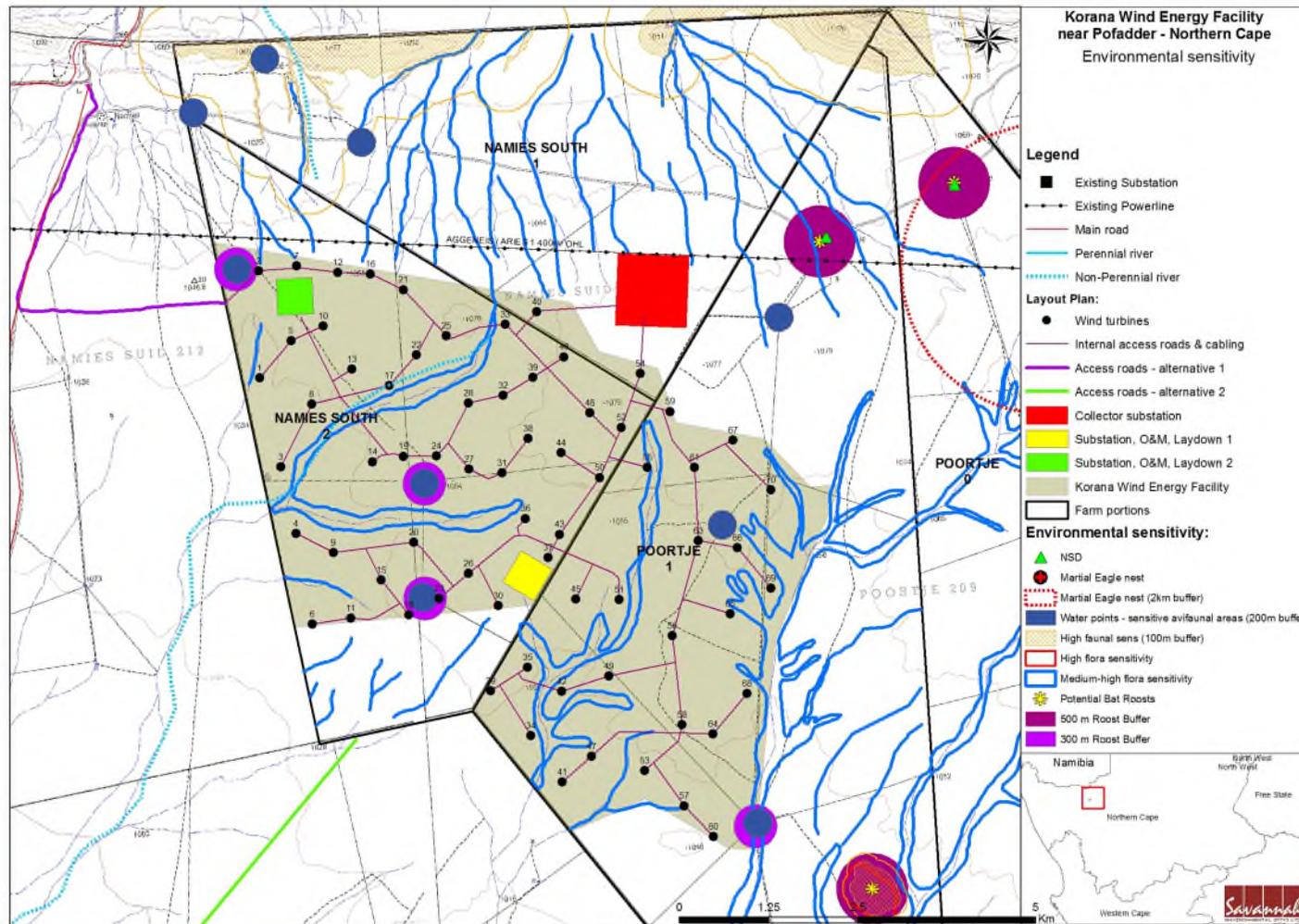


Figure 1.1: Sensitivity map for the Korana Wind Energy Facility site showing areas of high ecological, avifauna, fauna and bat sensitivity (refer to Appendix Q for an A3 map). 1

¹ Figure 1.1 depicts sensitivities identified during the EIA phase.

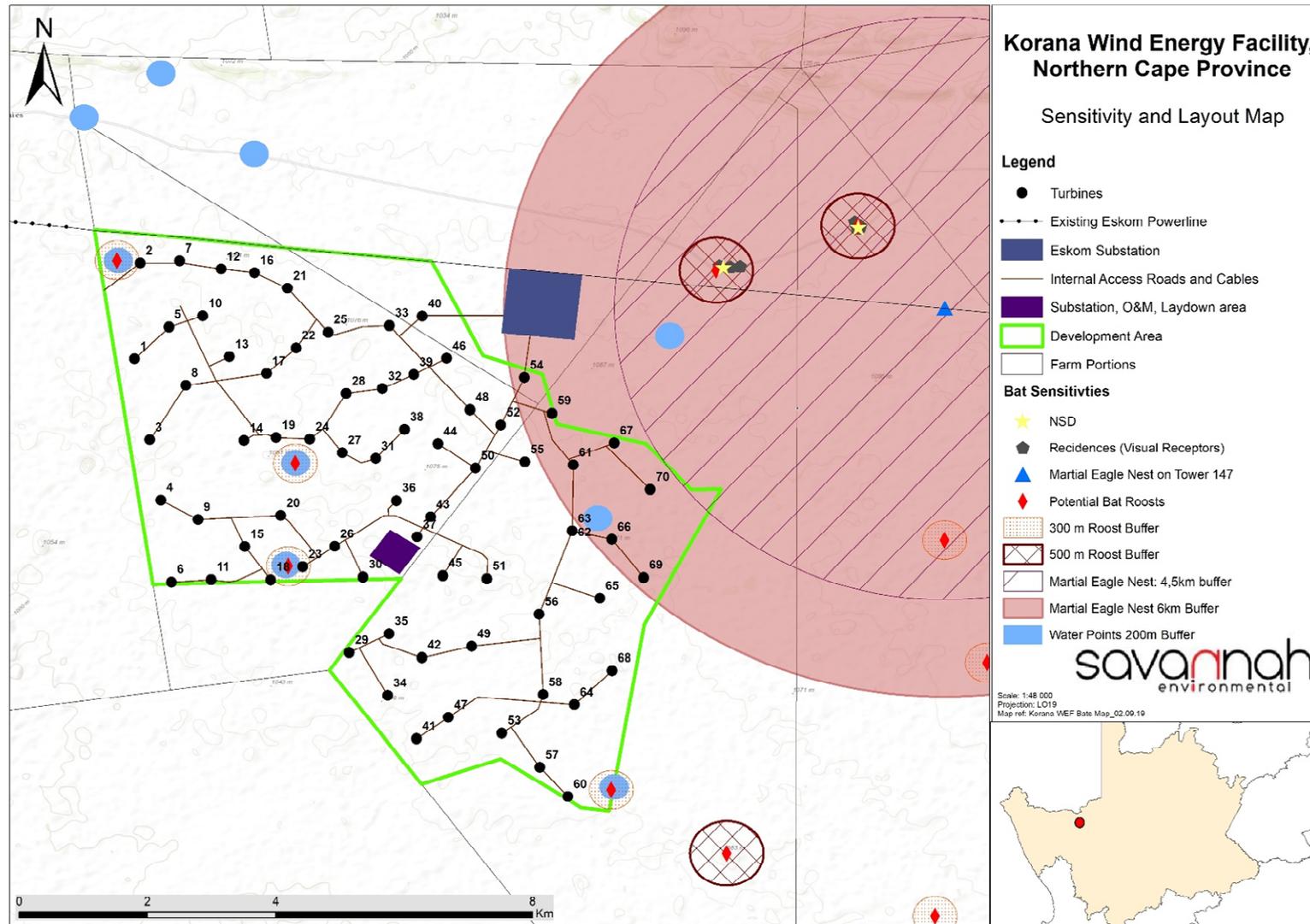


Figure 1.2: Environmental sensitivity map sensitivities identified during the EIA phase and includes updated the Martial Eagle Buffers added in the amendment process (2019)

1.3. Activities and Components associated with the Facility

The main activities/components associated with the Korana Wind Energy Facility are detailed in Table 1.1.

Table 1.1: Activities Associated with Planning, Construction, Operation and Decommissioning of the Facility

Main Activity/Project Component	Components of Activity	Details
Planning		
Conduct technical surveys	<ul style="list-style-type: none"> » Geotechnical survey by geotechnical engineer; » Site survey and confirmation of the infrastructure micro-siting footprint; » Survey of internal access routes; and » Survey of on-site substation. 	<ul style="list-style-type: none"> » All surveys are to be undertaken prior to initiating construction.
Construction		
Establishment of access roads	<ul style="list-style-type: none"> » Upgrade access/haul roads to the site, as required (this only refers to the main access roads leading directly to site itself). Establish internal access roads: 8m wide permanent roadway within the site between the turbines for use during construction and operation phase. » Temporary track for use during construction phase only. 	<ul style="list-style-type: none"> » Access roads will be constructed/upgraded in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. » Existing access roads to the site will be utilised, and upgraded where required. Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. » The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as specialist surveys). To accommodate the large crawler crane required for turbine assembly, a temporary track of up to 12 m in width is required to be established on the site. Permanent roads are expected to be up to 7m in width.
Undertake site preparation	<ul style="list-style-type: none"> » Site establishment of offices / workshop with ablutions and stores, contractor's yards. » Establishment of internal access roads (permanent and temporary roads). » Clearance of vegetation at the footprint of each turbine. » Excavations for foundations. 	<ul style="list-style-type: none"> » These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

Main Activity/Project Component	Components of Activity	Details
Establishment of lay down and hardstand areas on site	<ul style="list-style-type: none"> » Lay down areas (temporary footprint) at each turbine position for the storage of wind turbine components » Hardstand areas for crane lifting equipment. » Temporary lay down area for crane assembly. » Construction site offices. 	<ul style="list-style-type: none"> » Each turbine needs a flat lay down area during the construction process for the storage of wind turbine components. This area can be rehabilitated after construction unless required during operation. » The hardstand area will need to accommodate the cranes required in tower/turbine assembly. Hardstand and lay down areas will be required to be established for the normal civil engineering construction equipment which will be required on site. A large hardstand area will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides. » Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.
Construct wind turbine foundations	<ul style="list-style-type: none"> » Concrete foundations at each turbine location (final dimensions to be defined by geotechnical survey of the site). 	<ul style="list-style-type: none"> » Foundation holes will be mechanically excavated (with blasting being utilised only where required). » Shoring and safety barriers will be erected around open excavation. » Aggregate and cement to be transported from the closest centre to the development, with the establishment of a small concrete batching plant close to the activities.
Transport of components and equipment to site	<ul style="list-style-type: none"> » Flatbed trucks will be used to transport all components to site: » The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.). » The components required for the establishment of the substation (including transformers) * Components required for the establishment of the power line (including towers and cabling) 	<ul style="list-style-type: none"> » Turbine units consist of a tower comprised of typically 4 segments, a nacelle, rotor and three blades. » Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. mobile assembly crane and a main crane) to erect the wind turbines. » Other components include components required for the establishment of the substation (including transformers) and those required for the establishment of the power line (including towers and cabling). » The wind turbine, including tower, will be brought to site by the supplier in sections. The individual components are defined as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road

Main Activity/Project Component	Components of Activity	Details
		<p>infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself. It is estimated that 10 trucks will be used for the transport of each turbine.</p>
Erect turbines	<ul style="list-style-type: none"> » Large lifting crane used for lifting of large, heavy components » A small crane for the assembly of the rotor 	<ul style="list-style-type: none"> » The large lifting crane will lift the tower sections into place, assisted by the smaller crane. » The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower. » The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground by the smaller crane. It will then be lifted to the nacelle by the large crane, and bolted in place. Alternatively the blades may be lifted into position on the nacelle individually by the main crane. » It will take approximately 2-4 days to erect each turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.
Construct substations and associated ancillary infrastructure.	<ul style="list-style-type: none"> » A satellite 132 kV substation to facilitate grid connection. » Substation components. » Security fencing around high-voltage (HV) Yard. » Operations and Maintenance buildings » Workshop. 	<ul style="list-style-type: none"> » Will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. » A lay down area for building materials and equipment associated with these buildings will also be required. » The on-site substations will be constructed with a HV yard footprint of up to 100 m x 100 m. » The substation would be constructed as follows: <ul style="list-style-type: none"> * <u>Step 1</u>: Survey of the site * <u>Step 2</u>: Site clearing and levelling and construction of access road to substation site * <u>Step 3</u>: Construction of terrace and foundations * <u>Step 4</u>: Assembly, erection and installation of equipment (including transformers) * <u>Step 5</u>: Connection of conductors to equipment * <u>Step 6</u>: Rehabilitation of any disturbed areas and protection of erosion

Main Activity/Project Component	Components of Activity	Details
		sensitive areas.
Connection of the wind turbines to the on-site substations	<ul style="list-style-type: none"> » Wind turbines » 33 kV underground (where practical) electrical cabling connecting each turbine to the substations. 	<ul style="list-style-type: none"> » The installation of these cables will require the excavation of trenches, approximately 1 m in depth within which these cables can then be laid. The underground cables would follow the internal access roads as far as reasonably possible.
Connect substations to power grid ²	<ul style="list-style-type: none"> » A new 132kV overhead power line feeding into the power grid 	<ul style="list-style-type: none"> » The route for the power lines will be assessed, surveyed, and pegged prior to construction. » A servitude of approximately 32 m will be required for each of the power lines.
Commissioning of the facility	<ul style="list-style-type: none"> » Wind Energy Facility commissioning 	<ul style="list-style-type: none"> » Prior to the start-up of a wind turbine, a series of checks and tests will be carried out, including both static and dynamic tests to make sure the turbine is working within appropriate limits. » Grid interconnection and unit synchronisation will be undertaken to confirm the turbine performance. Physical adjustments may be needed such as changing the pitch of the blades of the turbines.
Undertake site rehabilitation	<ul style="list-style-type: none"> » Remove all construction equipment from the site. » Rehabilitation of temporarily disturbed areas where practical and reasonable. 	<ul style="list-style-type: none"> » On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.
Operation		
Operation	<ul style="list-style-type: none"> » Operation of turbines within the wind energy facility 	<ul style="list-style-type: none"> » Once operational, the Renewable Energy Facility will be monitored remotely. » No permanent staff will be required on site for any extended period. It is anticipated that there will be full time security, maintenance and control room staff required on site. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions, or maintenance activities.
Maintenance	<p>Maintenance activities include:</p> <ul style="list-style-type: none"> » Oil and grease – turbines; » Transformer oil – substation; and » Waste product disposal 	<ul style="list-style-type: none"> » The wind turbines will be subject to periodic maintenance and inspection. » Periodic oil changes will be required and any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation. » The turbine infrastructure is expected to have a lifespan of approximately 20 -

² A separate basic assessment process for the power line is being undertaken.

Main Activity/Project Component	Components of Activity	Details
		30 years, with maintenance.
<i>Decommissioning</i>		
Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes. » Preparation of the site (e.g. lay down areas, construction platform) » Mobilisation of construction equipment 	<ul style="list-style-type: none"> » Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.
Disassemble wind turbines	<ul style="list-style-type: none"> » A large crane will be used to disassemble the turbine and tower sections. 	<ul style="list-style-type: none"> » Turbine components would be reused, recycled or disposed of in accordance with regulatory requirements. » The hours of operation for noisy construction activities are guided by the Environment Conservation Act (noise control regulations). If the project requires construction work outside of the designated hours, regulatory authorities and affected stakeholders will be consulted and subsequent negotiations will be made to ensure the suitability of the revised activities (if applicable).

CHAPTER 2: PURPOSE AND OBJECTIVES OF THE EMPR

An Environmental Management Programme (EMPr) is defined 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 or mitigated, and that the positive benefits of the projects are enhanced”³. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, re-vegetation) and operation. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management for the proposed Korana Wind Energy Facility), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools for assisted use of the EMPr by the project implementer as well as compliance monitors).

The EMPr has the following objectives:

- » To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the wind energy facility.
- » To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » To propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

³ Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

The mitigation measures identified within the Environmental Impact Assessment process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

Mainstream must ensure that the implementation of the project complies with the requirements of any and all environmental authorisations and permits (once issued), as well as with obligations emanating from all relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation for activities associated with both construction and operation. Since this EMPr is part of the EIA process undertaken for the proposed Korana Energy Wind Facility, it is important that this document be read in conjunction with the Scoping Report and EIA Report, as well as the Environmental Authorisation (once issued). This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMPr for construction and operation activities has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. This EMPr should be considered a dynamic document, requiring regular review and updating as new information becomes available in order for it to remain relevant to the requirements of the site and the environment.

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

- » Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees must be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an appropriate Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, the EMPr specifications, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, and protected or Red List flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the Environmental Control Officer (ECO).

The EMPr is a dynamic document, which must be updated when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility. This will ensure that the project activities are planned and implemented taking sensitive environmental features into account.

The Korana Wind Energy Facility received an Environmental Authorisation (EA) on 28 May 2015 (as subsequently amended on 06 June 2018). In terms of this EA, the EMPr for the project is amendable (Condition 18), and must be implemented and strictly enforced. This EMPr forms part of an EA amendment

application for the project and includes additional mitigation measures as required by the specialist team (2019).

This amendment entails an updated turbine model for the project and is proposing the following:

1. An increase in rotor diameter for each turbine from **150m** to **up to 200m**;
2. An increase in hub height from **140m** to **up to 200m**; and
3. Individual turbine capacity (as specified on page 5 of the Environmental Authorisation issued on 28 May 2015) are to be removed.
4. A reduction in the number of turbines from **70 turbines** to a **maximum of 42 turbines**.

As required in terms of Regulation 32(1)(a)(iii), consideration was given to the requirement for additional measures to ensure avoidance, management and mitigation of impacts associated with the proposed change in the project details. From the specialist inputs provided into the amendment motivation, additional mitigation measures have been recommended. These additional mitigation measures have been shown in underlined text in this EMP, to illustrate which measures are novel inclusions and relate to the 2019 amendment only.

CHAPTER 3: STRUCTURE OF THIS EMPR

The first two chapters provide background to the EMP and the proposed project. The chapters which follow consider the following:

- » Planning and design activities
- » Construction activities
- » Operation activities
- » Decommissioning activities

These chapters set out the procedures necessary for the developer to achieve environmental compliance. For each of the phases of implementation for the wind energy facility project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators. A specific environmental management programme table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies

Project component/s	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> » Wind turbines » Access roads » Substations
Potential Impact	Brief description of potential environmental impact if objective is not met
Activity/risk source	Description of activities which could impact on achieving objective
Mitigation: Target/Objective	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

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

The objectives and EMP tables are required to be reviewed and possibly modified throughout the life of the facility whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components of the facility).
- » Modification to or addition to environmental objectives and targets.
- » Additional or unforeseen environmental impacts are identified and additional measures are required to be included in the EMP to prevent deterioration or further deterioration of the environment.
- » Relevant legal or other requirements are changed or introduced.
- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

Any amendments must be approved by the Competent Authority (i.e. DEA) prior to implementation, unless these are required to address an emergency situation.

Relevant EMP sections according to approval of scoping report

Plan / Study	Inclusion in EMP / EIA
Plan Rescue & Protection Plan	Appendix A
Alien Invasive Management Plan	Appendix B
Re-vegetation plan	Chapter 6, Objective 1 of EMP
Transportation plan	Appendix F
Traffic Management Plan	Appendix F
Stormwater Management Plan	Appendix G
Services Report	Refer to EIA, Chapter 2, Table 2.1
Fire Management Plane	Chapter 7, Objective 8 in EMP report
Erosion Management Plan	Appendix C
Open Space Management Plan	Appendix J

3.1. Project Team

This EMP was compiled by:

EMP Compilers	
Tebogo Mapinga	Savannah Environmental
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Karen Jodas	Savannah Environmental

Jo-Anne Thomas	Savannah Environmental
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Arlene Singh	Savannah Environmental
Input from Specialists	
Ecology	Dave McDonald of Bergwind Botanical Surveys & Tours
Fauna	Werner Marias of Animalia Zoological & Ecological Consultation cc
Avifauna	Chris van Rooyen of Chris van Rooyen Consulting
12- month Bat Monitoring	Jonathan Aronson and Jennifer Slack of Arcus Consultancy Services
	Stephanie Dippenaar of Stephanie Dippenaar Consulting (2019)
Soils, erosion and agricultural potential	Johann Lanz
Visual	Mandy van der Westhuizen of NuLeafe Planning & Environment and Lourens du Plessis of MetroGIS
Heritage	Tim Hart of ACO Associates
Noise	Morné de Jager of Enviro Acoustic Research cc
Social Impact	Tony Barbour (Environmental Consultant and Researcher)
Aquatic Assessment	Brian Colloty of Scherman Colloty and Associates

The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in EIA processes for more than ten (10) years. They have managed and drafted Environmental Management Programmes for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

CHAPTER 4: MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY: PRE-CONSTRUCTION

4.1. Goal for Pre-Construction

Overall Goal for Pre-Construction (Planning and Design): Undertake the pre-construction (planning and design) phase of the Wind Energy Facility in a way that:

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
- » Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the project.
- » Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area.

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

4.2. Objectives

OBJECTIVE 1: To ensure that the design of the facility responds to the identified environmental constraints and opportunities

From the specialist investigations undertaken for the proposed Korana Wind Energy Facility development site, areas of high sensitivity were identified (refer to Figure 1.1). The principle mitigation should be avoidance of identified sensitive areas.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations and buildings
Potential Impact	» Design fails to respond optimally to the identified environmental considerations
Activities/risk sources	<ul style="list-style-type: none"> » Positioning of turbines and access roads » Positioning of substations and buildings
Mitigation: Target/Objective	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, ecology, avifauna and bat sites, as detailed within the EIA report and relevant appendices.	Engineering Design Consultant / turbine supplier Mainstream	Tender design, design review stage
As far as possible, access roads and cable trenches which could potentially impact on sensitive areas should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.	Engineering Design Consultant Mainstream	Tender design, design review stage
Align underground cables and internal access roads as far as possible along existing infrastructure and disturbances.	Mainstream	Design
A buffer of at least 50m (from centre of stream for drainage) should be maintained around drainage lines	Mainstream	Design
A 200m buffer should be retained around water points as per the avifauna specialist study.	Mainstream	Design
<u>The number of turbines should be reduced to a maximum of 42 turbines (as per the bat and avifaunal specialist studies conducted during the EA amendment process).</u>	<u>Mainstream</u>	<u>Design</u>
<u>The 1.5km turbine-free buffer zone around the Martial Eagle nest on the Aries – Aggeneys 400kV 1 transmission line should be converted to a 4.5km turbine-free zone, and the number of turbines beyond the 4.5km turbine-free zone, up to a radius of 6km from the nest, should be restricted to no more than 13.</u>	<u>Mainstream</u>	<u>Design</u>
The locations of potential bat roosts are shown in the sensitivity map above and a buffer of 300 m and 500 m should be applied around these according to the kind of roost	Mainstream	Design
The quartzite koppies identified in the ecological report and mapped on Figure 1.1 should be avoided.	Mainstream	Design
A walk-through survey of final infrastructure positions for the wind energy facility and associated infrastructure should be undertaken by a specialist ecologist prior to the commencement of construction. The EMPr for construction must be updated to include site-specific information and specifications resulting from the final walk-through surveys. This EMPr must be submitted to DEA for approval prior to the commencement of construction.	Specialists	Final design phase

Mitigation: Action/control	Responsibility	Timeframe
Should the layout (or type of wind turbines used) change significantly during the final design, the new layout must be submitted to the Department.	Mainstream	Design phase
A detailed geotechnical investigation is required for the design phase for all infrastructure components.	Mainstream	Design phase
Implement a stormwater management plan for hard/compacted surfaces (e.g. substation footprints) as part of the final design of the project (see Appendix J for generic plan)	Mainstream	Design phase
Make use of existing roads where possible when planning the access road layout for the facility.	Relevant specialists Mainstream	Design phase
Obtain any additional environmental permits required (e.g. water use license, protected tree and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Mainstream	Design phase
Mining permit/license to be obtained for any borrow pits to be established for the project (if applicable).	Mainstream	Design phase
Obtain required abnormal load permits for transportation of project components to site.	Mainstream /contractor	Design phase
The noise emission specifications of wind turbine generators should be considered when selecting the equipment in order to ensure that noise impacts are minimised as far as possible.	Mainstream	Design phase
Plan the placement of lay-down areas and temporary construction accommodation in order to minimise vegetation clearing.	Mainstream	Design phase
Ensure that proper planning is undertaken regarding the placement of lighting structures for the substation and that light fixtures only illuminate areas inside the substation site.	Mainstream	Design
A lighting engineer must be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass. In addition, the possibility of motion activated security lighting should be investigated. This will allow for a predominantly dark site to be lit only as required.	Mainstream	Design
Aviation warning lights must be planned on turbine hub or such measures required by the Civil Aviation Authority. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility.	Mainstream	Design
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be	Mainstream	Pre-construction

Mitigation: Action/control	Responsibility	Timeframe
submitted to the Director: Compliance Monitoring at the DEA.		
Identify potential opportunities for local businesses.	Mainstream	Tender Design and Review stage
Develop a database of local BEE service providers and ensure that they are informed of relevant tenders and job opportunities.	Mainstream	Pre-construction
This EMP and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Mainstream	Tender process

Performance Indicator	<ul style="list-style-type: none"> » Design meets objectives and does not degrade the environment » Design and layouts respond to the mitigation measures and recommendations in the EIA report.
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager and Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE 2: To ensure effective communication mechanisms

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

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations and buildings
Potential Impact	<ul style="list-style-type: none"> » Impacts on affected and surrounding landowners and land uses
Activity/risk source	<ul style="list-style-type: none"> » Activities associated with construction » Activities associated with operation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in Appendix E) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Mainstream	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all	Mainstream	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.		
Liaison with landowners is to be undertaken prior to the commencement of construction in order to agree on landowner-specific conditions during construction and maintenance.	Mainstream	Pre-construction

Performance Indicator	» Effective communication procedures in place for all phases as required.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr. Grievance mechanism procedures should be implemented.

CHAPTER 5: MANAGEMENT PLAN FOR WIND ENERGY FACILITY: CONSTRUCTION

5.1. Overall Goal for Construction

The construction phase of the wind energy facility should be undertaken in such a way that ensures the construction activities are appropriately managed in respect of environmental aspects and impacts and enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, traffic and road use, and effects on local residents. The construction phase of the facility should also be undertaken in such a way as to minimise the impact on the vegetation, fauna and avifauna on the site as well as on any archaeological and historical value the site may have, as determined by the EIA.

5.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the Wind Energy Facility

As the Proponent, Mainstream must ensure that the implementation of the proposed project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. Mainstream will retain various key roles and responsibilities during the construction of the wind energy facility. These are outlined below.

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environmental Representative; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

The **Project Manager / Mainstream's Overall Representative** will:

- » Ensure of all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that Mainstream and its Contractor(s) are made aware of all stipulations within the EMPr.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully conversant with the Environmental Impact Assessment for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Site Manager** (Mainstream On-site Representative or Engineers Representative) will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the Environmental Management Programme.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.

- » Have overall responsibility of the EMPr and its implementation.
- » Conduct audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Project Manager, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.

The **Safety, Health and Environmental Representatives (Mainstream and Main Contractor)** will:

- » Develop and compile environmental policies and procedures.
- » Direct and liaise with the Environmental Control Officer (ECO) regarding monitoring and reporting on the environmental performance of the construction phase.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies on environmental performance and other issues as required.

Main Contractor: All contractors are ultimately responsible for:

- » Ensuring adherence to all environmental management specifications contained within this EMPr (and the Environmental Authorisation, once issued), as well as any specific specifications detailed by Mainstream.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

An independent **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Programme.
- » Be fully knowledgeable of all the licences and permits issued to the site.
- » Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- » Ensure that the contents of this EMPr are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.

- » Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Remedial action will be required by the responsible party in the event of contravention of the specifications of the EMPr.
- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep record of all activities on site, problems identified, transgressions noted and a schedule of tasks undertaken by the ECO in the form of a daily diary.
- » Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO, there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractor's Safety, Health and Environment Representative: The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, must be a suitably qualified individual appointed to be responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

The Contractor's Safety, Health and Environment Representative should:

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

5.3. Objectives

In order to meet the goal outlined in Section 5.1, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Securing the site and site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English and any other relevant indigenous languages, all to the approval of the Site Manager.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations » Operation and maintenance buildings
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners/public » Security of materials » Substantially increased damage to natural vegetation
Activities/risk sources	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	During site establishment Maintenance: for duration of Contract
Where necessary to control access, fence and secure area and implement access control procedures.	Contractor	During site establishment Maintenance: for duration of Contract
Fence and secure Contractor's equipment camp.	Contractor	During site establishment Maintenance: for duration of Contract
Location of concrete batching plant/s to be located in areas of low sensitivity within the approved development area.	Contractor	During site establishment
All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape).	Contractor	Erection: during site establishment Maintenance: for duration of Contract

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring	<ul style="list-style-type: none"> » Regular visual inspection of fence for signs of deterioration/forced access » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site. » ECO to monitor all construction areas on a continuous basis until all construction is

- completed; immediate report backs to site manager.
- » ECO to address any infringements with responsible contractors as soon as these are recorded.

OBJECTIVE 2: Maximise local employment and business opportunities associated with the construction phase

It is acknowledged that skilled personnel are required for the construction of the wind turbines and associated infrastructure. However, where semi-skilled and unskilled labour is required, opportunities for local employment should be maximised as far as possible.

Project component/s	» Construction activities associated with the establishment of the wind energy facility, including associated infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised. However, due to the relatively small size of the facility the number of employment and business opportunities for locals will be limited.
Activities/risk sources	» The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The appointed contractor should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. » Mainstream should develop a database of local BEE service providers.

Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area/ nearby towns as possible.	Contractor	Construction
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that local employment target is met.	Contractor	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Source as many local labourers as possible. » Database of potential local BEE services providers in place before construction phase commences.
Monitoring and Reporting	<ul style="list-style-type: none"> » Mainstream and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 3: Avoid the negative social impacts on family structures and social networks due to the presence of construction workers

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including an increase in alcohol and drug use, an increase in crime levels, the loss of girlfriends and or wives to construction workers, an increase in teenage and unwanted pregnancies, an increase in prostitution and an increase in sexually transmitted diseases.

The potential risk to local family structures and social networks is, however, likely to be low. The low and semi-skilled workers are likely to be local residents and will therefore form part of the local family and social network.

Project component/s	» Construction and establishment activities associated with the establishment of the wind energy facility, including associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks. » Presence of construction workers on site may result in loss of livestock due to stock theft and damage to farm infrastructure, such as gates and fences. Poaching of wild animals may also occur. » Due the relatively small number of workers associated with the construction of the proposed facility, the risk of impacts is likely to be low.
Activities/risk sources	<ul style="list-style-type: none"> » The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities. » The presence of construction workers on the site can result in stock thefts and damage to farm infrastructure.
Mitigation: Target/Objective	» Avoid and or minimise the potential impact of construction workers on the local community and livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area as possible. This should be included in the tender documents. Construction workers should be recruited from the local area in and around the towns such as Sutherland.	Contractor	Identify suitable local contractors prior to the tender process for the construction phase.
Establish contact with the adjacent farmers and develop a Code of Conduct for construction workers.	Mainstream & Contractor	Briefing session for construction workers held before they commence work on site.
Ensure that construction workers attend a briefing session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.		
Ensure that all workers are informed at the outset of the		

Mitigation: Action/control	Responsibility	Timeframe
construction phase of the conditions contained on the Code of Conduct.		
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dealt with appropriately. Dismissals must be in accordance with South African labour legislation.	Mainstream and contractors	Construction
No housing of construction workers on the site to be permitted, apart from security personnel.	Contractors	Construction
Implement a policy that no employment will be available at the gate.	Contractors	Construction
Compensate farmers / community members for cost for any losses, such as livestock, damage to infrastructure etc. proven to be associated with the project.	Contractors	Construction

Performance Indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that set out requirement for local employment and targets completed before construction phase commences. » Code of Conduct developed and approved prior to commencement of construction phase. » Labour locally sourced, where possible. » Tender documents for contractors include recommendations for construction camp. » All construction workers made aware of Code of Conduct within first week of being employed. » Briefing session with construction workers held at outset of construction phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Mainstream and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 4: Noise control

Various construction activities would be taking place during the development of the facility and may pose a noise risk to sensitive receptors. While the study undertaken in the EIA investigated likely and significant noisy activities, it did not evaluate all potential activities that could result in a noise impact, as these were not defined at the time of the study. Other construction activities not evaluated could include temporary or short-term activities where small equipment is used (such as the digging of trenches to lay underground power-cables).

Project component/s	<ul style="list-style-type: none"> » Construction of turbine (foundation, tower, nacelle and rotor) » Substations and buildings » Access roads
Potential Impact	» Nuisance noise from construction activities affecting the surrounding community
Activity/risk source	» Any construction activities taking place within 500 m from potentially sensitive receptors (PSR)
Mitigation: Target/Objective	» Ensure equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors.

- » Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA.
- » Prevent the generation of a disturbing or nuisance noises
- » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.
- » Ensuring compliance with the Noise Control Regulations

Mitigation: Action/control	Responsibility	Timeframe
Where possible, construction work should be undertaken during normal working hours (06H00 – 18H00), from Monday to Friday. If work is required on the weekend / public holiday, agreements can be reached (in writing) with the landowners adjacent to the work, these working hours can be extended.	Contractor	Construction
The construction crew must abide by the national standards and local by-laws regarding noise.	Contractor	Construction
All construction equipment, including vehicles, must be properly and appropriately maintained in order to minimise noise generation.	Contractor	Construction
Establish a line of communication and notify all stakeholders and sensitive receptors of the means of registering any issues, complaints or comments.	Contractor	All phases of project
Notify potentially sensitive receptors about work to take place at least 2 days before the activity in the vicinity (within 500 m) of the PSR is to start. The following information to be presented in writing: <ul style="list-style-type: none"> » Description of activity to take place » Estimated duration of activity » Working hours » Contact details of responsible party 	Contractor	At least 2 days, but not more than 5 days before activity is to commence

Performance Indicator	<ul style="list-style-type: none"> » No complaints received concerning noise. » Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors. » Maximum noise levels at potentially sensitive receptors are less than 65 dBA.
Monitoring and Reporting	<ul style="list-style-type: none"> » Should a complaint about noise be reported, Mainstream to look into the matter and determine steps to deal with the complaint. An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 5: Management of dust and emissions and damage to roads

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

Project component/s	<ul style="list-style-type: none"> » wind turbines » access roads » substations and buildings
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Potential Impact	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activities/risk sources	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and also minimise damage to roads.

Mitigation: Action/control	Responsibility	Timeframe
Implement appropriate dust suppression measures on site such as wetting roads on a regular basis.	Contractor	Construction
Haul vehicles moving outside the construction site carrying material that can be wind-blown should be covered with tarpaulins.	Contractor	Duration of contract
Ensure vehicles adhere to speed limits on public roads and speed limits set within the site by the Site Manager. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractor/ transportation contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable after construction is complete in an area.	Contractor	At completion of the construction phase
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Prior to construction phase
Ensure that damage to gravel public roads and access roads attributable to construction vehicles is repaired before completion of construction phase.	Contractor	Before completion of construction phase
Regular dust control of materials (sand, soil, cement) must be used at concrete batching plants on site	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Appropriate dust suppression measures implemented on site during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring and Reporting	<ul style="list-style-type: none"> » Mainstream and appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 6: Soil and rock degradation and erosion control

The natural soil on the site needs to be preserved as far as possible to minimise impacts on the environment. Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern in areas underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion). Uncontrolled run-off relating to construction activity (excessive wetting, etc.) will also lead to accelerated erosion. Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Steep slope are prone to soil erosion and good soil management must be undertaken during construction.

A set of strictly adhered to mitigation measures are required to be implemented in order to effectively limit the impact on the environment. The disturbance areas where human impact is likely are the focus of the mitigation measures laid out below.

Project component/s	<ul style="list-style-type: none"> » wind turbines » access roads » substations » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas). » All other infrastructure
Potential Impact	<ul style="list-style-type: none"> » Erosion and soil loss » Negative impacts on wetlands » Disturbance to or loss of wetland/pan habitat » Sedimentation of watercourses/wetland areas » A loss of indigenous vegetation cover » Increased runoff into drainage lines can potentially be associated with accelerated erosion
Activities/risk sources	<ul style="list-style-type: none"> » Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Concentrated discharge of water from construction activity » Stormwater run-off from sealed surfaces » Mobile construction equipment movement on site » River/stream/drainage line road crossings » Roadside drainage ditches » Project related infrastructure, such as buildings, turbines and fences
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines » To minimise damage to vegetation by erosion or deposition » To minimise damage to rock, soil and vegetation by construction activity » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover » No reduction in the surface area of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure » Minimal loss of vegetation cover due to construction related activities » No or insignificant loss of wetland area in the specialist study area » No increase in runoff into drainage lines as a result of construction of project related

- infrastructure
 » No increase in runoff into drainage lines as a result of road construction

Mitigation: Action/control	Responsibility	Timeframe
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from drainage lines. Limit the height of stockpiles to 2m to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
New access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil.	Engineer / Contractor	Before and during construction
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas.	Contractor	Construction
Rehabilitate disturbance areas as soon as construction in an area is completed.	Contractor	During and after construction
Stockpiles not used in three (3) months after stripping must be seeded or appropriately covered to prevent dust and erosion - only if natural seeding does not occur.	Contractor	During and after construction
Erosion control measures: Implement run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets or temporary mulching over denuded areas.	Contractor	Erection: Before construction Maintenance: Duration of contract
Particular care should be taken in the design of road drainage line and wetland crossings in order to ensure there is no step in the channel bed, substrate continuity is maintained and no undue constriction of flow takes place.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance of the culverts must be carried out.	Engineer / Contractor	Before and during construction
Control depth of all excavations and stability of cut faces/sidewalls.	Engineer / Contractor	Maintenance over duration of contract
Compile a comprehensive stormwater management plan as part of the final design of the project and implement during construction and operation.	Contractor	Compile during design; implement during construction & operation
Cement batching to take place in designated areas only, as approved on site layout (if applicable).	Contractor	Construction
Spillages of cement to be cleaned up immediately and disposed or re-used in the construction process.	Contractor	Construction
Spill kits to be kept on active parts of the construction site & at site offices.	Contractor	Construction
Soil erosion control measures (such as hessian mats and gabions) be used for in erosion prone areas such as steep slopes.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No activity outside of designated areas » Minimal level of soil erosion around site as a result of construction activities » Minimal level of increased siltation in drainage lines as a result of construction activities » Minimal level of soil degradation as a result of construction activities
Monitoring and Reporting	<ul style="list-style-type: none"> » Continual inspections of the site by ECO » Fortnightly inspections of sediment control devices by ECO » Reporting of ineffective sediment control systems and rectification as soon as possible. » An incident reporting system must record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 7: Limit disturbance and avoid damage to drainage lines

The layout for the wind energy facility avoids the placement of infrastructure within drainage areas. However, there are still some instances where roads and cables cross identified drainage lines. Mitigation measures are required to minimise impacts on those systems affected in this regard.

Project component/s	<ul style="list-style-type: none"> » access roads » cabling
Potential Impact	» Damage to drainage line areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil or vegetation, dumping of material within wetlands). The focus should be on the functioning of the drainage line as a natural system.
Activity/risk source	» Construction of access roads and cabling
Mitigation: Target/Objective	» No damage to drainage lines within project area

Mitigation: Action/control	Responsibility	Timeframe
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Contractor	Construction
Control stormwater and runoff water. Contaminated runoff from the construction site(s) should be prevented from entering the rivers/streams.	Contractor	Construction
For any new construction where direct impacts on drainage lines are unavoidable cross watercourses perpendicularly to minimise disturbance footprints.	Contractor	Construction
Construction must not result in the width of the watercourse being narrowed.	Contractor	Construction
Utilise erosion control measures on access roads and drainage lines where required.	Contractor	Construction
Ablution facilities at the construction sites must be located at least 100m away from drainage lines and regularly serviced	Contractor	Construction
Concrete batching plants and stockpiles to be located	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
more than 500m away from drainage lines.		

Performance Indicator	» No impacts on water quality, water quantity, wetland vegetation, natural status of wetland
Monitoring and Reporting	<ul style="list-style-type: none"> » Habitat loss in watercourses should be monitored before and after construction. » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 8: Limit disturbance of vegetation and loss of protected flora during construction

Impacts on vegetation at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation in development footprint areas. Due to disturbance of vegetation, there is a higher risk of alien species dominating disturbed areas. Therefore, control of alien invasive plants is required.

Project component/s	All infrastructure and activities which result in vegetation loss or clearing including: <ul style="list-style-type: none"> » Clearing for roads and excavation for turbine foundations » Underground cabling » Access roads
Potential Impact	» Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants
Activity/risk source	Vegetation clearing for the following: <ul style="list-style-type: none"> » Turbine construction and service areas » Access roads » Laydown areas » Construction Camps
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To reduce the footprint and low impact on terrestrial environment » To reduce the impact on protected plant species

Mitigation: Action/control	Responsibility	Timeframe
Preconstruction walk-through of development footprint and use micro-siting to reduce local impact.	Specialists	Construction
Revegetation of cleared areas or monitoring should be implemented to ensure that recovery is taking place	Contractor	Construction
A site rehabilitation programme should be compiled and implemented.	Contractor consultation with Specialist	Duration of contract
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible once construction is complete in an area » Do not import soil from areas with alien plants 	Contractor	Construction
Establish an on-going monitoring programme to detect,	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
quantify and remove any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act, Act 43 of 1983 and NEM: Biodiversity Act)		
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Vegetation loss must be restricted to infrastructure footprint » Low impact on protected plant species » A permit must be obtained for the destruction or translocate affected individuals of protected species.
Monitoring and Reporting	<p>ECO to monitor construction to ensure that:</p> <ul style="list-style-type: none"> » Vegetation is cleared only within essential areas » Erosion risk is maintained at an acceptable level through flow regulation structures where appropriate and the maintenance of plant cover wherever possible

OBJECTIVE 9: Protection of fauna, avifauna and bats

Infrastructure associated with the facility often impacts on birds and animals. New roads constructed will also have a disturbance and habitat destruction impact.

No construction activities with the potential to affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and construction mitigation.

Project component/s	<ul style="list-style-type: none"> » wind turbines and associated laydown areas » access roads and cabling » substations » workshop area » batching plants » temporary laydown areas » associated access road
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats » Disturbance of birds
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise footprints of habitat destruction » To minimise disturbance to resident and visitor faunal and avifaunal species

Mitigation: Action/control	Responsibility	Timeframe
Clearly mark areas to be cleared in order to eliminate unnecessary clearing/disturbance.	Contractor in consultation with Specialist	Pre-construction

Mitigation: Action/control	Responsibility	Timeframe
Potential bat roosts should be monitored at least once a month for the duration of the construction phase to search for evidence of roosting bats (i.e. guano, culled insects remains). If and construction roosting bats are located, a bat specialist should be consulted to determine future actions	Contractor in consultation with Specialist	Construction
<u>As bat activity is markedly higher over low wind speed periods, all turbines must be feathered below cut in speed and not allow for freewheeling. Preventing freewheeling should not affect energy production significantly but will be a substantial bat conservation mitigation measure.</u>	Contractor in consultation with Specialist	Construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Minimum disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna and avifauna » Limited impacts on faunal species (i.e. noted/recorded fatalities), especially those of conservation concern.
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks by ECO » An incident reporting system must be used to record non-conformances to the EMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE 11: Minimisation of visual impacts associated with construction

During construction heavy vehicles, components, cranes, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users.

Project component/s	<ul style="list-style-type: none"> » Construction site » access roads » Wind turbines
Potential Impact	<ul style="list-style-type: none"> » The potential scarring of the landscape due to the creation of new access roads/tracks or the unnecessary removal of vegetation. » Construction traffic
Activity/risk source	<ul style="list-style-type: none"> » The viewing of visual scarring by observers in the vicinity of the facility or from the roads traversing the site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Minimal disturbance to vegetation cover in close vicinity to the proposed facility and its related infrastructure » Minimised construction traffic, where possible

Mitigation: Action/control	Responsibility	Timeframe
The general appearance of construction activities, construction equipment camps and lay-down areas must be maintained and kept neat and tidy by means of the timely removal of rubble and disused construction materials.	Contractor	Construction
The turbines must be painted a pale, matt, non-reflective colour (i.e. off white, as specified by CAA) before erection of the turbines.	Contractor	Erection of turbines
Limit access to the construction sites (during both construction and operational phases) along existing access roads as far as possible.	Contractor	Duration of contract
Ensure all disturbed areas are appropriately rehabilitated once construction in an area is complete.	Contractor	Duration of construction

Performance Indicator	<ul style="list-style-type: none"> » Construction site maintained in a neat and tidy condition. » Vegetation cover that remains intact with no erosion scarring in close proximity of the facility. » Site appropriately rehabilitated after construction is complete.
Monitoring	<ul style="list-style-type: none"> » Monitoring of vegetation clearing during the construction phase. » Monitoring of rehabilitation activities to ensure appropriate rehabilitation of the site. » An incident reporting system will be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 12: Appropriate handling and storage of chemicals, hazardous substances and waste

The construction phase of the wind energy facility will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include general solid waste, hazardous waste and liquid waste.

Project component/s	<ul style="list-style-type: none"> » wind turbines » substations » concrete batching plant
Potential Impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks » Power line construction activities » Substation construction activities » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons » To ensure that the storage and maintenance of machinery on-site does not cause

- pollution of the environment or harm to persons
- » To comply with waste management legislation
- » To minimise production of waste
- » To ensure appropriate waste storage and disposal
- » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files, as defined by the ECO.	Contractor	Duration of contract
Any spills will receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be complied with.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.	Contractor	Duration of contract
An incident/complaints register must be established and maintained on-site.	Contractor	Duration of contract
Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Supply waste collection bins at construction equipment and construction crew camps.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
Spilled cement and concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Spill kits to be kept on-site	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Upon the completion of construction, the area will be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints must be investigated and, if appropriate, acted upon. » Observation and supervision of waste management practices throughout construction phase. » Waste collection to be monitored on a regular basis. » Waste documentation completed. » An incident reporting system must be used to record non-conformances to the EMP. » The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

OBJECTIVE 13: Ensure disciplined conduct of on-site contractors and workers

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the EIA Report and this EMP, as well as the requirements of all relevant environmental legislation.

Project component/s	<ul style="list-style-type: none"> » Wind energy facility » Associated infrastructure
Potential Impact	<ul style="list-style-type: none"> » Pollution/contamination of the environment » Disturbance to the environment and surrounding communities
Activity/risk source	<ul style="list-style-type: none"> » Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/control	Responsibility	Timeframe
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting must be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors. Ablution facilities must not be placed within 100m from any river, wetland or drainage line.	Contractor (and sub-contractor/s)	Duration of contract
Cooking must take place in a designated area. No	Contractor (and sub-	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
firewood or kindling may be gathered from the site or surrounds.	contractor/s)	
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO, will disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Compliance with specified conditions of Environmental Authorisation, EIA report and EMPr. » No complaints regarding contractor behaviour or habits. » Code of Conduct drafted before commencement of construction phase and briefing session with construction workers held at outset of construction phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation and supervision of Contractor practices throughout construction phase. » A complaints register must be maintained, in which any complaints from the community are to be logged. Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 14: To avoid and or minimise the potential risk of increased veld fires during the construction phase.

Project component/s	» Wind energy facility and associated infrastructure
Potential Impact	» Fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activity/risk source	» Contractors are not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment
Mitigation: Target/Objective	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/control	Responsibility	Timeframe
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Contractor	Construction
Provide adequate firefighting equipment on-site.	Contractor	Construction
Provide fire-fighting training to selected construction staff.	Contractor	Construction
Compensate farmers / community members at full market related replacement cost for any losses due to the wind energy facility project, such as livestock, damage to infrastructure etc.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Designated areas for fires identified on site at the outset of the construction phase. » Firefighting equipment and training provided before the construction phase
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	<p>commences.</p> <ul style="list-style-type: none"> » Compensation claims settled after claim verified by independent party.
Monitoring	<ul style="list-style-type: none"> » A complaints register must be maintained, in which any complaints from the community are to be logged. Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances in the EMPr.

5.4. Detailing Method Statements

OBJECTIVE 15: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

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

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

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

The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

5.5. Awareness and Competence: Construction Phase of the Renewable Energy Facility

OBJECTIVE 16: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

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

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that appropriate communication tools are used to outline the environmental "do's" and "don'ts" (as per the environmental awareness training course) to employees.
- » Records must be kept of those that have completed the relevant training.
- » Refresher sessions must be held to ensure the contractor's staff are aware of their environmental obligations.

5.6. Monitoring Programme: Construction Phase of the Renewable Energy Facility

OBJECTIVE 17: To monitor the performance of the control strategies employed against environmental objectives and standards

An environmental monitoring programme should be developed and implemented not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of environmental monitoring will most likely be stipulated by the Environmental Authorisation.

Where this is not clearly dictated, Mainstream will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

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

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation
- » Provide a mechanism for the lodging and resolution of public complaints
- » Ensure appropriate and adequate record keeping related to environmental compliance
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- » Aid communication and feedback to authorities and stakeholders

The Environmental Control Officer (ECO) will monitor compliance with the EMPr during construction, and will conduct monitoring activities on a regular basis. An independent ECO must be appointed, and have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will report any non-compliance or where corrective action is necessary to the Site Manager, DEA and/or any other monitoring body stipulated by the regulating authorities.

CHAPTER 6: MANAGEMENT PLAN FOR WIND ENERGY FACILITY: REHABILITATION OF DISTURBED AREAS

6.1. Overall Goal for the Rehabilitation of Disturbed Areas

Overall Goal for the Rehabilitation of Disturbed Areas: Undertake the rehabilitation measures in a way that:

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

6.2. Objectives

Overall Goal for the Rehabilitation of Disturbed Areas: Undertake the rehabilitation measures in a way that:

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

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

OBJECTIVE 1: To ensure rehabilitation of disturbed areas

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations.

Project component/s	<ul style="list-style-type: none"> » wind energy facility (including temporary access roads and laydown areas) » substations » temporary laydown areas
Potential Impact	<ul style="list-style-type: none"> » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
Activity/risk source	<ul style="list-style-type: none"> » Temporary laydown areas » Temporary access roads/tracks » Other disturbed areas/footprints
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure and encourage site rehabilitation of disturbed areas » To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed

Mitigation: Action/control	Responsibility	Timeframe
A site rehabilitation programme should be compiled and implemented.	Contractor in consultation with Specialist	Duration of contract
All temporary facilities, equipment and waste materials must be removed from site and appropriately disposed of.	Contractor	Following execution of the works

Mitigation: Action/control	Responsibility	Timeframe
All temporary fencing and danger tape should be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use native/indigenous plant species removed from disturbance areas in the rehabilitation phase.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Mainstream in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis.	Mainstream in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	<ul style="list-style-type: none"> » All portions of site, including construction camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and at least 40% plant cover achieved on rehabilitated sites over a period of 2 to 5 years. » Closed site free of erosion and alien invasive plants
Monitoring and Reporting	<ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis. » An incident reporting system must be used to record non-conformances to the EMPr.

CHAPTER 7: MANAGEMENT PROGRAMME FOR THE WIND ENERGY FACILITY: OPERATION

An environmental manager or similar should be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats. In addition, it is important to monitor the incidence of bird collisions with the wind turbines, as well as bat fatalities. Should any significant impacts of the facility on priority bird or bat populations be detected by the monitoring programmes, mitigation could be required to be investigated for those selected problem turbines.

7.1. Overall Goal for Operation

Overall Goal for Operation: To ensure that the operation of the wind energy facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the wind energy facility in a way that ensures that operation activities are properly managed in respect of environmental aspects and impacts and enables the wind energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents as well as minimising impacts on birds and other fauna using the site.

7.2. Objectives

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

OBJECTIVE 1: Securing the site

Safety issues may arise with public access to wind turbines (e.g. unauthorised entry to the site) or to the wind farm substation. Prevention and control measures to manage public access are therefore important.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » access roads » substations » Operations and service building
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners and public
Activities/risk sources	<ul style="list-style-type: none"> » Uncontrolled access to the wind energy facility and associated infrastructure.
Mitigation:	<ul style="list-style-type: none"> » To secure the site against unauthorised entry
Target/Objective	<ul style="list-style-type: none"> » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Where necessary to control access and secure access to the site and entrances to the site	Mainstream	Operation
Post information boards about public safety hazards and	Mainstream	Operation

Mitigation: Action/control	Responsibility	Timeframe
emergency contact information		

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring and Reporting	<ul style="list-style-type: none"> » Regular visual inspection of fence for signs of deterioration/forced access » An incident reporting system must be used to record non-conformances to the EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 2: Limit the ecological footprint of the facility

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	<ul style="list-style-type: none"> » Areas requiring regular maintenance » Route of the security team » Areas disturbed during the construction phase and subsequently rehabilitated at its completion
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of vegetation and/or habitat » Alien plant invasion » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk Source	<ul style="list-style-type: none"> » Movement of employee vehicles within and around site.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Mainstream	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Mainstream	Operation
Vegetation control within the facility should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner	Mainstream / Specialist	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Mainstream	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified	Mainstream /Specialist	Annual monitoring until successful re-establishment of vegetation in an area

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation or terrestrial faunal habitats » No erosion problems within the facility or along the power line route » Low abundance of alien plants within affected areas » Maintenance of a ground cover of perennial grasses and forbs that resist erosion » Continued improvement of rehabilitation efforts
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas » Annual monitoring with records of alien species presence and clearing actions » Annual monitoring with records of erosion problems and mitigation actions taken with photographs

OBJECTIVE 3: Protection of avifauna, priority bird species and bat species

During operation of the facility, the threat of collision of birds and bats with the turbine blades is a concerning issue. However, the real extent of this threat is not currently well understood within the South African context due to the limited numbers of wind turbines in South Africa with which bird and bat interactions have been monitored. Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Bird and bat monitoring is to be undertaken during the operation of the facility in order to monitor impacts on the facility on these communities and make recommendations for any additional measures which may be required to be implemented to minimise this impact.

Project component/s	<ul style="list-style-type: none"> » wind energy facility (turbines) » substations
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of birds as a result of collision with the turbine blades » Disturbance to or loss of bats as a result of collision with turbines and/or barotrauma » Electrocutation and collision with the power line
Activity/risk source	<ul style="list-style-type: none"> » Spinning turbine blades » Substation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » More accurately determine the impact of the operating wind energy facility on priority bird species » Minimise impacts associated with the substation

Mitigation: Action/control	Responsibility	Timeframe
A site monitoring programme must be implemented for surveying bird and bat movements in relation to the wind energy facility and fully documenting all collision and electrocution casualties with the turbines (in line with most recent monitoring guidelines at the time).	Mainstream environmental manager /	Operation Phase
Periodically collate and analyse post-construction monitoring data for bird and bat monitoring and recommend additional mitigation measures for implementation as required.	Advising scientist/biologist	Every 3 months of monitoring

Mitigation: Action/control	Responsibility	Timeframe
Review bird and bat monitoring report on the full year of post-construction monitoring, and integrate findings into operational EMPr and broader mitigation scheme.	Advising scientist/biologist, monitoring agency	1 year post-construction
<u>Post-construction avifaunal monitoring should be undertaken for the first three years of operation, and then repeated again in year 5, and again every five years thereafter. The exact scope and nature of the post-construction monitoring will be informed on an ongoing basis by the result of the monitoring through a process of adaptive management.</u>	<u>Advising scientist/biologist, monitoring agency</u>	<u>Operation Phase</u>
<u>The operational bat monitoring programme should already be in place at the onset of wind farm operation and should be implemented immediately after construction of turbines. Mitigation measures outlined by the Bat Specialist during the operational monitoring study should be applied with due diligence.</u>	<u>Advising scientist/biologist, monitoring agency</u>	<u>Operation Phase</u>
<u>To refine mitigation measures and to account for the lack of data, the appropriate turbines, as indicated by the post-construction bat specialist, should be installed with bat monitoring equipment at height.</u>	<u>Advising scientist/biologist, monitoring agency</u>	<u>Operation Phase</u>
<u>As bat activity is markedly higher over low wind speed periods, all turbines must be feathered below cut in speed and not allow for freewheeling. Preventing freewheeling should not affect energy production significantly but will be a substantial bat conservation mitigation measure.</u>	<u>Advising scientist/biologist, monitoring agency</u>	<u>From the start of the Operational Phase</u>

Performance Indicator	<ul style="list-style-type: none"> » Minimal additional disturbance to bird or bat populations on the wind energy facility site. » Continued improvement of bird and bat protection devices, as informed by the operational monitoring. » Regular provision of clearly worded, logical and objective information on the interface between the local avifauna and bats and the proposed/ operating wind energy facility. » Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development, from pre-construction to operational phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades » The monitoring team to monitor turbine field for fatalities. » Review of bird monitoring report on the full year of post-construction monitoring

OBJECTIVE 4: Minimisation of visual impact

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual

impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "Wind turbines shall be painted white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

Another source of glare light, albeit not as intense as flood lighting, is the aircraft warning lights mounted on top of the hub of the wind turbines. These lights are less aggravating due to the toned-down red colour, but have the potential to be visible from a great distance. The Civil Aviation Authority (CAA) prescribes these warning lights and the potential to mitigate their visual impacts is low. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility. In this manner less warning lights can be utilised to delineate the facility as one large obstruction, thereby lessening the potential visual impact. The regulations for the CAA's *Marking of Obstacles* should be strictly adhered to, as the failure of complying with these guidelines may result in the developer being required to fit additional light fixtures at closer intervals thereby aggravating the visual impact.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis. The operational, security and safety lighting fixtures of the proposed wind energy facility.

Project component/s	<ul style="list-style-type: none"> » Wind energy facility (including access roads) » Substations
Potential Impact	<ul style="list-style-type: none"> » Risk to aircraft in terms of the potential for collision » Enhanced visual intrusion
Activity/risk source	<ul style="list-style-type: none"> » Substation and associated lighting » Wind turbines and other infrastructure
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise potential for visual impact » To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircraft » Minimise contrast with surrounding environment and visibility of the turbines to humans » The containment of light emitted from the substation in order to eliminate the risk of additional night-time visual impacts

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility in an aesthetically pleasing way.	Mainstream	Operation and maintenance
Undertake regular maintenance of light fixtures.	Mainstream	Operation and maintenance

Performance Indicator	<ul style="list-style-type: none"> » Appropriate visibility of infrastructure to aircraft » The effective containment of the light to the substation site
Monitoring and Reporting	<ul style="list-style-type: none"> » Ensure that aviation warning lights or other measures are installed before construction is completed and are fully functional at all time » The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

OBJECTIVE 5: Minimisation of noise impacts from turbines

From the results of the EIA studies undertaken, noise impacts associated with the wind energy facility are expected to be of low significance. However, mitigation measures are proposed in order to further reduce any potential for noise impact. The rating level in the area for the wind energy facility is likely to be 35 dBA at night. That would also be the “lower limit”. Due to the limited noise receptors in and around the site (as identified in the noise impact assessment report), noise from the turbine is unlikely to negatively affect any residents in the broader study area.

Project component/s	» Wind turbines
Potential Impact	<ul style="list-style-type: none"> » Increased noise levels at potentially sensitive receptors » Changing ambient sound levels could change the acceptable land use capability » Disturbing character of sound
Activity/risk source	» Wind turbines
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Ensure that the change in ambient sound levels (measured in L_{Aeq}) as experienced by Potentially Sensitive Receptors is less than 5 dBA; (change from the measured and calculated ambient sound levels for the corresponding wind speed); » Prevent the generation of disturbing noise from the wind turbines; » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors

Mitigation: Action/control	Responsibility	Timeframe
If required, additional noise monitoring points at a complainant that registered a valid and reasonable noise complaint relating to the operation of the facility	Mainstream / Acoustical Consultant / Approved Noise Inspection Authority	Operation

Performance Indicator	» Change in ambient sound levels (L_{Aeq}) as experienced by Potentially Sensitive Receptors is less than 5 dBA
Monitoring and Reporting	» Noise monitoring programme to be developed and implemented at the start of operation.

OBJECTIVE 6: Appropriate handling and management of hazardous substances and waste

The operation of the wind energy facility will involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste and hazardous waste.

Project component/s	<ul style="list-style-type: none"> » Wind energy turbines » Substations
Potential Impact	» Inefficient use of resources resulting in excessive waste generation

	» Litter or contamination of the site or water through poor waste management practices
Activity/risk source	<ul style="list-style-type: none"> » Generators and gearbox - turbines » Transformers and switchgear - substation » Fuel and oil storage
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	Mainstream	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	Mainstream	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Mainstream	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and banded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Mainstream	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Mainstream / waste management contractor	Operation
Used oils and chemicals: <ul style="list-style-type: none"> » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations. 	Mainstream	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Mainstream	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Mainstream	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Mainstream	Operation
No waste may be burned or buried on site.	Mainstream	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or dumping. » Internal site audits identifying that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests.
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	<ul style="list-style-type: none"> » No contamination of soil or water.
Monitoring and Reporting	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection on request. » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the environmental manager. All appropriate waste disposal certificates must accompany the monthly reports.

OBJECTIVE 7: Maximise local employment and business opportunities during operation

Based on information provided by Mainstream approximately 20 permanent employment opportunities will be created during the operational phase of the project. The operational phase is expected to last for 20 years.

Project component/s	<ul style="list-style-type: none"> » Wind energy facility » Day to day operational activities associated with the wind energy facility including maintenance etc.
Potential Impact	<ul style="list-style-type: none"> » The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activity/risk source	<ul style="list-style-type: none"> » The operational phase of the wind energy facility will create permanent employment opportunities. » The establishment of a wind energy facility has the potential to create and attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Benefit to local tourism by providing the area with a potential additional tourist attraction. » In the medium- to long-term employ as many locals as possible to fill the full time employment opportunities.

Mitigation: Action/control	Responsibility	Timeframe
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	Mainstream	Prior to commencement of operation
Develop training and skills transfer programme for local personnel.	Mainstream	Prior to commencement of operation

Performance Indicator	<ul style="list-style-type: none"> » Public exposure to the project. » Meeting with Local Municipality and local tourism organisations during the construction phase.
Monitoring and Reporting	<ul style="list-style-type: none"> » Indicators listed above must be met for the operational phase.

OBJECTIVE 8: Implement an appropriate fire management plan during the operation phase

The vegetation in the study area may be at risk of fire. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Operation and maintenance of the wind energy facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a very minor risk to the wind energy facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate firefighting equipment on site. Apply for membership to local Fire Protection Association, should there be one in existence.	Mainstream	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Mainstream	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Mainstream	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.). Access roads may also act as fire breaks.	Mainstream	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Mainstream	Operation
Contact details of emergency services should be prominently displayed on site.	Mainstream	Operation

Performance Indicator	» Firefighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring and Reporting	» Mainstream must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 9: Minimise the potential negative impact on farming activities and on the surrounding landowners

Once operational, the negative impact on the daily living and movement patterns of neighbouring residents is expected to be minimal and intermittent (i.e. the increase in traffic to and from site, possible dust creation of vehicle movement on gravel roads on site and possible increase in criminal activities). The number of workers on site on a daily basis is anticipated to have minimal negative social impacts in this regard.

Some positive impacts will be experienced with farmers gaining more access to land through the high quality site roads. Farmers involved with the project will also receive additional income, which can be invested into farming activities.

Once construction is completed, negative impacts on farming activities on the site must be limited as far as possible.

Project Component/s	<ul style="list-style-type: none"> » Possible negative impacts of activities undertaken on site on the activities of surrounding property owners. » Impact on farming activities on site.
Potential Impact	<ul style="list-style-type: none"> » Limited intrusion impact on surrounding land owners. » Interference with farming activities on site.
Activities/Risk Sources	<ul style="list-style-type: none"> » Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents. » Operational activities on site could interfere with farming activities of landowner.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Mainstream	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Mainstream	Operation
Local roads should be maintained to keep the road surface up to a reasonable standard.	Mainstream	Operation
Limit the development of new access roads on site.	Mainstream	Operation
Ensure on-going communication with the landowners of the site in order to ensure minimal impact on farming activities	Mainstream	Operation

Performance Indicator	<ul style="list-style-type: none"> » No environmental pollution occurs (i.e. waste, water and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities on site.
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Monitoring and reporting	» Mainstream should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.
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CHAPTER 8: MANAGEMENT PLAN FOR WIND ENERGY FACILITY: DECOMMISSIONING

The turbine infrastructure which will be utilised for the proposed Wind Energy Facility is expected to have a lifespan of 25 to 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time. The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMP to be revisited and amended.

8.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required abnormal load equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

8.2 Disassemble and Remove Existing Components

The wind (turbine and tower sections) of the proposed facility will be disassembled once it reaches the end of its economic lifespan. A large crane would be required for disassembling the turbine and tower sections. Once disassembled, the components will be reused, recycled, or disposed of in accordance with regulatory requirements (NEMA / NEM:WA). All parts of the turbine would be considered reusable or recyclable except for the blades.

8.2 Rehabilitation of the Site

In order to minimise the extent of rehabilitation activities required during the decommissioning phase, Mainstream must ensure that constant effort is applied to rehabilitation activities throughout the construction, operation and maintenance phases of the project.

In decommissioning the facility, Mainstream must ensure that:

- » All sites not already vegetated are vegetated as soon as possible after operation ceases with species appropriate to the area.
- » Any fauna encountered during decommission should be removed to safety by a suitably qualified person,
- » All structures, foundations and sealed areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site.
- » All access/service roads not required to be retained by landowners are closed and fully rehabilitated.
- » All vehicles to adhere to low speed limits (40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust.

- » All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
- » All rehabilitated areas are monitored for erosion.
- » Components of the facility are removed from the site and disposed of appropriately.
- » Retrenchments should comply with South African Labour legislation of the day.

The section on Rehabilitation (Chapter 6) is also relevant to the decommissioning of sections of the proposed distribution line and must be adhered to.

CHAPTER 9: REVISION OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications following the final walk-through survey by specialists of the development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features. In addition, the EMPr should be updated throughout the life of the facility in order to ensure that appropriate measure are included for the minimisation of impacts on the environment. Any amendments must be approved by the Competent Authority (i.e. DEA) prior to implementation, unless these are required to address an emergency situation.

APPENDIX A:
PLANT RESCUE AND PROTECTION AND REHABILITATION

**APPENDIX B:
ALIEN INVASIVE MANAGEMENT PLAN**

**APPENDIX C:
EROSION MANAGEMENT PLAN**

**APPENDIX D:
CONSTRUCTION WASTE GUIDELINE**

**APPENDIX E:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS
AND ISSUES**

**APPENDIX F:
TRAFFIC MANAGEMENT PLAN**

**APPENDIX G:
STORMWATER MANAGEMENT PLAN**

**APPENDIX H:
OPERATIONAL BIRD MONITORING PROGRAMME**

**APPENDIX I:
OPEN SPACE MANAGEMENT PLAN**