
KARREEBOSCH WIND FARM AND ASSOCIATED INFRASTRUCTURE NORTHERN CAPE & WESTERN CAPE PROVINCES

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the
Final Environmental Impact Assessment Report
September 2015

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/807
Title	:	Environmental Impact Assessment Process Draft Environmental Management Programme: Karreebosch Wind Farm And Associated Infrastructure, Northern Cape & Western Cape Provinces
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Client	:	Karreebosch Wind Farm (Pty) Ltd
Report Status	:	Draft Environmental Management Programme submitted as part of the Final Environmental Impact Assessment Report

When used as a reference this report should be cited as: Savannah Environmental (2015) Draft Environmental Management Plan: Karreebosch Wind Farm and Associated Infrastructure, Northern Cape and Western Cape Provinces.

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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, in accordance with the Noise Control Regulations.

'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).

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 are 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 120m 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 120 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 the National Environmental Management: Waste Act (NEM:WA); or
- c) any other substance, material or object that is not included in Schedule 3 of NEM:WA 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
SAHRA	South African Heritage Resources Agency
SALT	South African Large Telescope
SANRAL	South African National Roads Agency Limited
SHE	Safety, Health and Environment

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PROJECT DETAILS

CHAPTER 1

1.1. Overview of the Proposed Project

Karreebosch Wind Farm (Pty) Ltd proposes to construct a wind energy facility on a site located approximately 40km north of Matjiesfontein, and approximately 40 km south of Sutherland. The site falls within the Karoo Hoogland Local Municipality, Northern Cape and the Laingsburg Local Municipality, Western Cape. The proposed facility will utilise wind turbines to generate electricity that will be fed into the National Power Grid.

The site for Karreebosch Wind Farm includes the following eighteen farm portions:

Portion Farm Name Farm No	Local Municipality	Province
The Farm Appelsfontein 201	Karoo Hoogland Municipality	Northern Cape
The Remainder of Ek Kraal 199	Karoo Hoogland Municipality	Northern Cape
Portion 1 of Ek Kraal 199	Karoo Hoogland Municipality	Northern Cape
Portion 2 of Ek Kraal 199	Karoo Hoogland Municipality	Northern Cape
The Remainder of Karreebosch 200	Karoo Hoogland Municipality	Northern Cape
Portion 1 of Karreebosch 200	Karoo Hoogland Municipality	Northern Cape
Portion 1 of Karre Kloof 196	Karoo Hoogland Municipality	Northern Cape
The Remainder of Klipbanksfontein 198	Karoo Hoogland Municipality	Northern Cape
Portion 1 of Klipbanksfontein 198	Karoo Hoogland Municipality	Northern Cape
The Farm Kranskraal 189	Karoo Hoogland Municipality	Northern Cape
The Farm Oude Huis 195	Karoo Hoogland Municipality	Northern Cape
The Farm Rietfontein 197	Karoo Hoogland Municipality	Northern Cape
The Farm Roode Wal 187	Karoo Hoogland Municipality	Northern Cape
Portion 2 of Standvastigheid 210	Karoo Hoogland Municipality	Northern Cape
The Remainder of Wilgebosch Rivier 188	Karoo Hoogland Municipality	Northern Cape
The Farm Aprils Kraal 105	Laingsburg Municipality	Western Cape
The Remainder of Bon Espirange 73	Laingsburg Municipality	Western Cape
Portion 1 of Bon Espirange 73	Laingsburg Municipality	Western Cape

Based on the outcomes of the EIA undertaken for this project, the following infrastructure is to be included in Karreebosch wind farm project:

- » **66 turbines** (2MW to 3.3MW in capacity each) with a foundation of 25m in diameter and 4m in depth, following layout revisions based on specialist input,

- » The hub height of each turbine will be up to 100 metres, and the rotor diameter up to 140 metres.
- » Permanent compacted hardstanding areas / crane pads for each wind turbine (70m x 50m).
- » Electrical turbine transformers (690V/33kV) at each turbine (2m x 2m footprint typical but up to 10m x 10m at certain locations)
- » Internal access roads up to 12 m wide.
- » Approximately 25km of 33kV overhead power lines and approximately 25km of 132kV overhead power lines to Eskom's Komsberg substation.
- » Power line alternative 2a and Alternative 2 substations: The power line route connects to 2 x 33/132kV Substations – referred to as Alternative 2 Substation West and Alternative 2 Substation Centre (as described in Chapter 4).
 - » Alternative 2 Substation West and Alternative 2 Substation Centre, are located on the Western Ridge, north of Turbine 17 and on the Centre Ridge, between Turbine 48 and 49 respectively.
 - » Alternative 2a connects Alternative 2 Substation West with Alternative 2 Substation Centre via a 132kV power line in a northeast direction and continues as one single 132kV line towards the R354 in the southeast and to Komsberg in the south. Two electrical substations (on-site 33/132 kV substations) will have a footprint of 100m x 200m
- » Underground park cabling between turbines buried along internal access roads.

- » Extension of the existing 400kV Substation at Komsberg with several electrical components to be defined by Eskom (e.g. additional feeder bay, transformer bay) on the existing substation property

- » An operations and maintenance building (O&M building) next to the on-site substation.
- » Up to 4 x 100m tall wind measuring masts.
- » Temporary infrastructure required during the construction Phase includes construction lay down areas and a construction camp up to 9ha (300m x 300m).
- » A borrow pit for locally sourcing aggregates required for construction (~3ha).

The proposed layout, as recommended in the EIA as the preferred option for implementation, is presented in Figure 1.1.

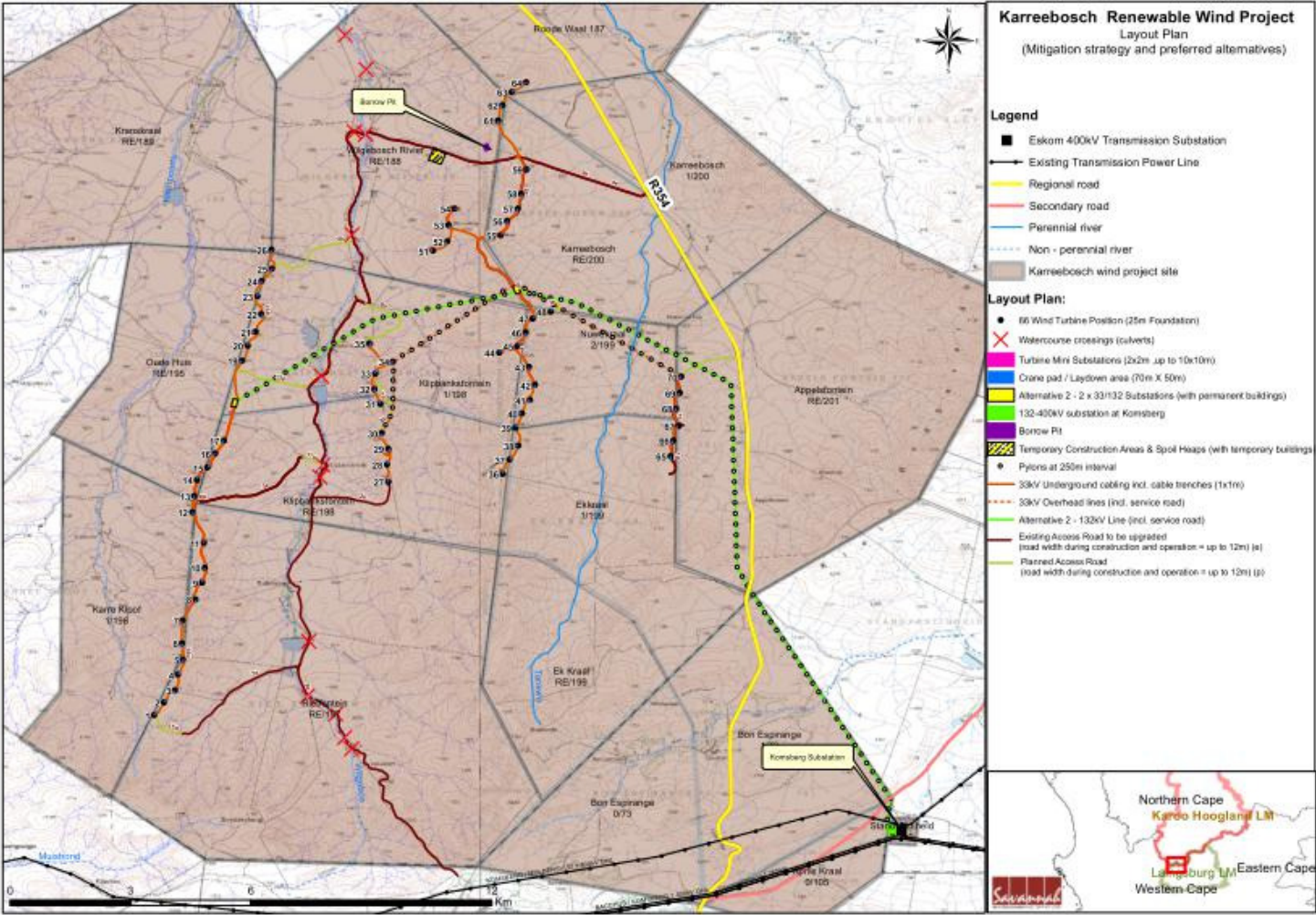


Figure 1.1: Post-mitigation preferred layout for the Karreebosch Wind Farm and associated infrastructure

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 findings of the EIA report and the specialist studies undertaken within this EIA for Karreebosch Wind Farm conclude that:

- » With the implementation and adoption of the recommended mitigation, monitoring and management measures, there are no environmental grounds or fatal flaws that should prevent the proposed wind energy facility and associated infrastructure from proceeding on the identified site.
- » The most significant impacts associated with the construction and operational phases of the development of the Karreebosch wind energy facility (without the use of mitigation measure) are impacts on flora and fauna, and visual impacts.
- » Majority of the environmental and social impacts associated with development Karreebosch wind energy facility will be of moderate significance and of acceptable levels. The proposed development also represents an investment in clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Although no environmental fatal flaws were identified to be associated with the proposed project, a number of sensitive environmental areas were identified within which specific mitigation and management is required to minimise impacts. The nominated preferred (post-mitigation) layout has been developed to avoid these sensitive areas as far as possible (refer to Figure 1.2).

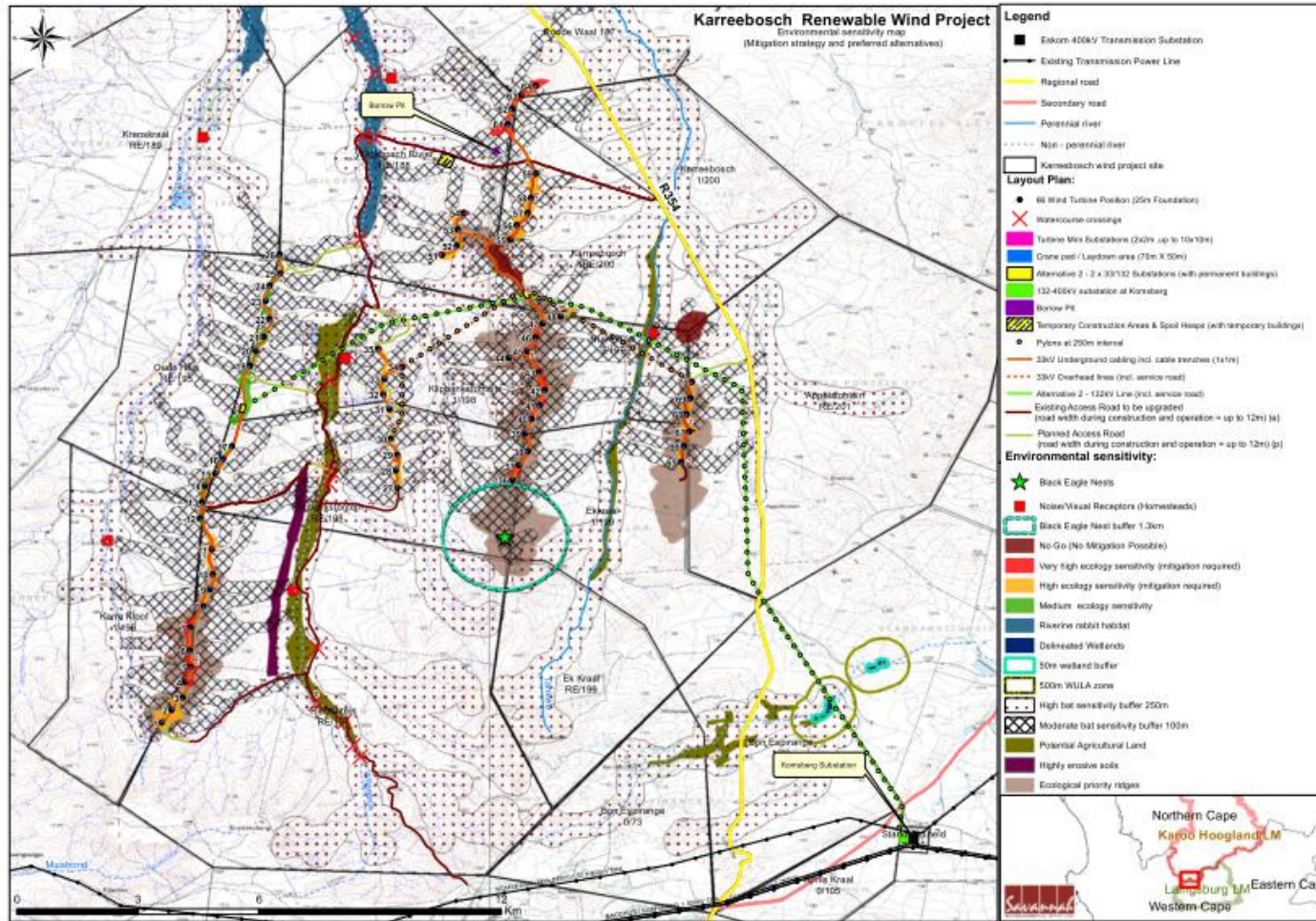


Figure 1.2: Sensitivity map for the Karreebosch Wind Farm site showing areas of environmental sensitivity identified through the EIA

1.3. Activities and Components associated with the Facility

The main activities/components associated with the Karreebosch Wind Farm are detailed in Table 1.1.

Table 1.1: Activities Associated with Planning (Post Authorisation), Construction, Operation and Decommissioning of the Facility

Main Activity/Project Component	Components of Activity	Details
Planning (Post-Authorisation)		
Conduct technical surveys and undertake micro-siting Micro-siting will be done as part of the detailed site planning process to ensure that the environmental risks are minimised and the technical requirements of the project can be achieved. Micro-siting will ensure that the turbine positions or associated infrastructure will be located outside of areas mapped or identified as sensitive no-go zones and that any environmental constraints at the specific turbine positions and road alignments are identified, avoided or managed.	<ul style="list-style-type: none"> » Detailed geotechnical investigations and surveys by geotechnical engineer » Site survey by specialists and confirmation of the infrastructure micro-siting footprint » Survey of internal access routes » Survey of on-site substation site and grid route 	<ul style="list-style-type: none"> » All surveys are to be undertaken prior to initiating construction. » The turbine positions may be micro-sited based on additional site data from these surveys.
Construction		
Establishment of access roads	<ul style="list-style-type: none"> » Construction of access/haul roads to the site. » Establish internal access roads: up to 12m wide permanent roadway within the site between the turbines for use during construction and operational 	<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

Main Activity/Project Component	Components of Activity	Details
	phases. » Temporary tracks to be established for use during construction phase only where applicable.	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). Permanent roads are expected to be up to 12m in width.
Undertake site preparation	» Site establishment of offices / workshop with ablutions and stores, contractor's yards. » Clearance of vegetation at the footprint of each turbine.	» These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site. As per objective 7 of section 7.1.
Establishment of lay down and hardstand areas on site	» Lay down areas (temporary footprint) at each turbine position for the storage of wind turbine components » Hardstand areas (permanent) for crane lifting equipment. » Temporary lay down area for crane assembly. » Construction site offices.	» 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.
Excavate wind turbine foundations	» Concrete foundations at each turbine location.	» Foundation holes will be mechanically excavated (with blasting being utilised with circumspection, only where necessary). » Shoring and safety barriers will be erected around open excavation. » Aggregate and cement to be transported from the closest batching centre to the development, with the establishment of a small concrete batching plant close to the activities.
Transport of components and equipment to site	» Flatbed trucks will be used to transport all components to site,	» The wind turbines, including towers, will be brought to site by the supplier in sections. The individual components are defined as

Main Activity/Project Component	Components of Activity	Details
	including: * Components of the wind turbines, comprising typically 4 segments, a nacelle, rotor and three blades * The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.). * Components required for the establishment of the substation (including transformers) * Components required for the establishment of the power line (including towers and cabling)	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 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 and project components will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Erect turbines	» Large lifting crane used for lifting of large, heavy components. » A small crane for the assembly of the rotor.	» 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.	» Substation components. » Security fencing around high-voltage	» The construction of these components will require the clearing of vegetation and levelling of the development site and the excavation

Main Activity/Project Component	Components of Activity	Details
	(HV) Yard. » Workshop.	of foundations prior to construction. » A lay down area for building materials and equipment associated with these buildings will also be required. » The substation would be constructed as follows: * <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 sensitive areas.
Connection of the wind turbines to the on-site substations	» Wind turbines » Electrical turbine transformer for each turbine » 33 kV electrical cabling connecting each turbine to the substations. » There will be up to two electrical substations (33/132kV) on site	» The installation of some 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. » There will also be overhead cables that link the turbine strings together and also the on-site substation.
Connect substations to power grid	» A new 132kV overhead power line connecting from the on-site substation into the power grid. » A substation connecting the 132 kv line from the project to the Eskom grid. » Substation at Komsberg with several electrical components such as additional feeder bay, transformer bay on the existing substation property »	» The route for the power line will be assessed, surveyed, and pegged prior to construction. » A servitude of approximately 32 m will be required for the power line. » Definition of the required electrical components and extension of the existing 400kV to accommodate the

Main Activity/Project Component	Components of Activity	Details
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. » Clean up the site from all construction related rubble, stockpiles and waste. 	<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. » All rubble, stockpiles and any other waste materials resulting from the construction process will be cleared.
Operation		
Operation	<ul style="list-style-type: none"> » Operation of turbines within the wind energy facility and grid connection infrastructure » Operation and maintenance (O&M) facility to be a site-based control centre with communications infrastructure for remote access. 	<ul style="list-style-type: none"> » Once operational, the wind farm will be monitored through the O&M facility and remotely. » Operations staff will be required on site but not always there 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, shut-down due to hazard (e.g extreme weather conditions), or maintenance activities.
Maintenance	<p>Regular Maintenance activities include:</p> <ul style="list-style-type: none"> » Oil and grease – turbines; » Transformer oil – substation; and » Waste product disposal <p>Other maintenance activities relate to mechanical, communications, electronic and control functions.</p>	<ul style="list-style-type: none"> » The wind turbines and associated infrastructure 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 25 - 30 years, with maintenance.
Decommissioning		

Main Activity/Project Component	Components of Activity	Details
Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of the access to the site to accommodate required equipment. » Preparation of the site (e.g. lay down areas, etc.) » Mobilisation of de-construction equipment and cranes. 	<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 removal of the turbines and other infrastructure from the site.
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.

PURPOSE AND OBJECTIVES OF THE EMPr

CHAPTER 2

An Environmental Management Programme (EMPr) is a set of guidelines and actions aimed at ensuring that construction and/or installation activities, and subsequent management of facilities as well as decommissioning, are undertaken in a manner that minimises environmental risks and impacts. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project. The EMPr is required in order to:

- » assist in ensuring continuing compliance with South African legislation and Karreebosch Wind Farm Environmental Health and Safety Policy (a policy is currently being developed for the Wind Energy industry);
- » provide a mechanism for ensuring that measures identified in the EIA designed to mitigate potentially adverse impacts are implemented;
- » provide a framework for mitigating impacts and environmental risks that may be unforeseen or unidentified prior to commencement of construction;
- » provide assurance to regulators and stakeholders that the obligations and/or requirements with respect to environmental and socio-economic performance will be met; and
- » provide a framework for compliance auditing and inspection programs.

The EMPr provides specific environmental guidance for the planning, 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 Karreebosch Wind Farm, 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 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.

Karreebosch Wind Farm (Pty) Ltd 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. One of these obligations 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 of the proposed development. Since this EMPr is part of the EIA process undertaken for the proposed Karreebosch Wind Farm, it is important that this document be read in conjunction with the EIA Report (August 2015), 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 Appendix 4 of the EIA Regulations (GNR982), and will be further developed in terms of specific requirements listed in any authorisations and permits issued for the proposed project.

The EMPr will remain a working document and must be updated at various stages of the planning and implementation process, to ensure incorporation of any additional findings from further studies (e.g. monitoring) and as design details become clearer. The EMPr should be subject to review by senior management responsible for the project at the following stages of the project:

It should be noted that the design phase referred to in this EMP is post-environmental authorization phase, and therefore some permitting requirements that are associated with the design phase will only take place once Environmental Authorization is received.

- » Prior to the initiation of the construction phase (post pre-construction monitoring) to ensure that all relevant management actions have been included, including those from the environmental authorisation and specialist walk-through surveys (as detailed in Chapter 5).
- » Following the construction and rehabilitation phase and after the start of operation, to capture additional and unforeseen mitigation measures that are identified during these activities, and would be relevant to the operational phase.
- » Prior to final decommissioning and closure.

STRUCTURE OF THIS EMPR

CHAPTER 3

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

- » Legislative permitting requirements
- » Roles and responsibilities
- » Pre-construction (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 » Power line
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 EMPr 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 EMPr to prevent deterioration or curb further deterioration of the environment.
- » Relevant legal or other obligations/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 through an amendment process, unless these are required to address an emergency situation.

3.1. Content of the EMPr: Legislated and DEA Requirements

Table 3.1: Content of this EMPr in terms of NEMA and Appendix 4 of the EIA Regulations of December 2014 as well as DEA requirements in the Acceptance of Scoping letter

Requirement	EMP Reference
EMP REQUIREMENTS IN TERMS OF APPENDIX 4 OF EIA REGULATIONS	
a) details of— (i) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr	Section 3.2
b) (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 1.3, Table 1.1
c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and	Appendix J

Requirement	EMP Reference
<p>infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;</p>	
<p>d) a description of the impact management objectives, including management statements, identifying the impacts that need to be avoided, managed and/or mitigated as identified through the environmental impact assessment process for all phases of the development including–</p> <ul style="list-style-type: none"> (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iii) where relevant operation activities; and (iv) rehabilitation of the environment after construction and where applicable post closure; 	<p>Chapter 6 – Preconstruction and planning</p> <p>Chapter 7 – Construction activities</p> <p>Chapter 8 – Rehabilitation</p> <p>Chapter 9 – Operation activities</p>
<p>e) a description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph (c);</p>	<p>Chapters 7-9</p>
<p>f) a description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved, and may include actions to –</p> <ul style="list-style-type: none"> (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable 	<p>Actions listed in terms of each Objective detailed in Chapters 7-9</p> <p>No financial provisions in terms of the NEMA are applicable for the Karreebosch Wind Farm.</p> <p>Financial provisions of the act do not apply to renewable energy projects but rather mining related projects.</p>
<p>g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (e);</p>	<p>Monitoring requirements listed under each Objective detailed in Chapters 7 - 9</p>
<p>h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (e);</p>	<p>Monitoring requirements and timeframes listed under each Objective detailed in Chapters 7 - 9</p>
<p>i) an indication of the persons who will be responsible for the implementation of the impact management actions;</p>	<p>Responsibility listed for each management action under each Objective detailed in Chapters 7 - 9</p>

Requirement	EMP Reference
j) the time periods within which the impact management actions contemplated in paragraph (e) must be implemented;	Timeframes listed for each management action under each Objective detailed in Chapters 7 - 9
k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (e);	Monitoring requirements listed under each Objective detailed in Chapters 7 - 9
l) a program for reporting on compliance, taking into account the requirements as prescribed by these Regulations; and	Section 7.6
m) an environmental awareness plan describing the manner in which—	Section 7.5
(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	
(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	
EMPR REQUIREMENTS IN TERMS OF ACCEPTANCE OF SCOPING APPROVAL LETTER	
All recommendations and mitigation measures in EIAr and specialist studies	Chapters 6 - 9
Final site layout map	Figure 1.1
Measures as dictated by final site layout map and micro siting	Chapter 6
Sensitivity map	Figure 1.2
Final layout overlain on sensitivity map	Figure 1.2
Alien invasive management plan	Appendix E
Plant rescue & protection plan	Appendix A
Re-vegetation and habitat rehabilitation plan	Appendix G
Open space management plan	Appendix F
Traffic management plan	Appendix H
Transportation plan	Appendix H
Erosion management plan	Appendix D
Fire management plan	Objective 15, Section 7.2 Objective 7, Section 9.2
Leak / spillage monitoring system	Objective 13, Section 7.1 Monitoring done by ECO
Measures to protect hydrological features from spillage of pollutants	Objective 8, Section 7.2

3.2. Project Team

Savannah Environmental was contracted by Karreebosch Wind Farm (Pty) Ltd as the independent environmental consultant to undertake the EIA for the proposed

project (including the compilation of the EMPr). Neither Savannah Environmental nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to Karreebosch Wind Farm (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

The EAPs from Savannah Environmental who are responsible for this EIA process are:

- » John von Mayer – a registered Professional Natural Scientist and the principal author of this report. He holds a Bachelor of Science degree with Honours in Environmental Science and has 7 years of experience in environmental management and environmental impact assessment.
- » Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 18 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

In order to adequately identify and assess potential environmental impacts associated with Karreebosch Wind Farm, Savannah Environmental obtained input from the following specialist sub-consultants to conduct revised/ updated specialist impact assessments for the Karreebosch project:

Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology (including flora and fauna)

Tony Williams of African Insights cc	Avifauna
Rob Simmons of Birds Unlimited Environmental Consultants	Avifauna (specific focus on raptors)
Werner Marais of Animalia	Bats
Lourens du Plessis of MetroGIS	Visual impact
Tim Hart and team of ACO Associates	Heritage
Tony Barbour Environmental Consulting and Research	Social
Adrian Jongens of JKA Associates	Noise
Dr John Almond of Natura Viva cc	Palaeontology
Dr Brian Colloty of Scherman Colloty & Associates	Hydrology / Aquatic Studies
Jaco Jansen of Savannah Environmental and Jasper Dreyer of the North West University	Soils and Agricultural potential

The curricula vitae for EAPs from Savannah Environmental as well as the specialist consultant team are included in Appendix A of the EIA Report.

LEGISLATIVE PERMITTING REQUIREMENTS

CHAPTER 4

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Karreebosch Wind Farm (Pty) Ltd is responsible for ensuring that the necessary permits are in place in order to comply with national and local regulations. The legislative permitting requirements relevant to the wind farm are detailed in Table 4.1.

Table 5.2: Relevant legislative permitting requirements applicable to the Karreebosch Wind Farm

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998 as amended)	<p>EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of sections 24 and 24D of NEMA, as read with Government Notices R983, R984 and R985, a Scoping and EIA process is required to be undertaken for the proposed project.</p>	<p>National Department of Environmental Affairs – lead authority.</p> <p>Provincial Environmental Departments – commenting authority.</p>	<p>The final EIA report is to be submitted to the DEA and Provincial Environmental Departments in support of the application for authorisation.</p>
National Environmental Management Act (Act No 107 of 1998)	<p>In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of</p>	<p>Department of Environmental Affairs (as regulator of NEMA).</p>	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	a variety of impacts.		
National Environmental Management: Waste Act (Act No 59 of 2008)	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of this Act (GN 921), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unfit for the safe 	<p>Hazardous Waste – National DEA General Waste –DEA&DP; DEDET</p>	<p>A waste licence could be required in the event that more than 100m³ of general waste or more than 35m² of hazardous waste is to be stored on site at any one time. The volumes of waste generated during construction and operation of the facility are not expected to be large enough to require a waste license.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>storage of waste.</p> <ul style="list-style-type: none"> » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. 		
<p>Environment Conservation Act (Act No 73 of 1989)</p>	<p>In terms of section 25 of the ECA, the national noise-control regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice No R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.</p> <p>Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996, legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial Noise Control Regulations exist in the Western Cape Province.</p> <p>Allows the Minister of Environmental Affairs to make regulations regarding noise, among other concerns.</p>	<p>National Department of Environmental Affairs</p> <p>Provincial Environmental Department - commenting authority.</p> <p>Local Municipality</p>	<p>There is no requirement for a noise permit in terms of the legislation; although a provision is made that exemption from any of the regulations of the NCR can be applied for from a local authority. A Noise Impact Assessment is required to be undertaken in accordance with SANS 10328 – this has been undertaken as part of the EIA process. There are noise level limits which must be adhered to.</p>
<p>National Environmental Management: Air Quality</p>	<p>Sections 18, 19 and 20 of the Act allow certain areas to be declared and managed as "priority</p>	<p>National Department of Environmental Affairs – air</p>	<p>No permitting or licensing requirements applicable for air quality</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Act (Act No 39 of 2004)	<p>areas" in terms of air quality.</p> <p>Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.</p> <p>Section 32 makes provision for measures in respect of dust control.</p> <p>Section 34 makes provision for:</p> <p>(1) the Minister to prescribe essential national noise standards -</p> <p>(a) for the control of noise, either in general or by specified machinery or activities or in specified places or areas; or</p> <p>(b) for determining -</p> <p>(i) a definition of noise</p> <p>(ii) the maximum levels of noise</p> <p>(2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards.</p>	<p>quality</p> <p>Local Municipality - Noise</p>	<p>aspects.</p> <p>The section of the Act regarding noise control is in force, but no standards have yet been promulgated. Draft regulations have however, been promulgated for adoption by Local Authorities.</p> <p>An atmospheric emission licence issued in terms of Section 22 may contain conditions in respect of noise. This will however, not be relevant to the facility, as no atmospheric emissions will take place.</p> <p>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.</p>
National Heritage Resources Act (Act No 25 of 1999)	<p>Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including</p> <ul style="list-style-type: none"> » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » any development or other activity which will 	<ul style="list-style-type: none"> » National Department of Environmental Affairs where heritage assessment is a component of the EIA » South African Heritage 	<p>Section 4 of the NHRA provides that within 14 days of receipt of notification the relevant Heritage Resources Authority must notify the proponent to submit an impact assessment report if they believe a</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>change the character of a site exceeding 5 000 m² in extent.</p> <p>The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m²; or the re-zoning of a site exceeding 10 000 m² in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided.</p> <p>Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.</p>	<p>Resources Agency (SAHRA) – National heritage sites (grade 1 sites) as well as all historic graves and human remains.</p> <ul style="list-style-type: none"> » Heritage Western Cape – Issue of permits for removal or destruction of heritage resources in the Western Cape. » Ngwao Boswa Kapa Bokoni: Northern Cape - Issue of permits for removal or destruction of heritage resources in the Northern Cape 	<p>heritage resource may be affected.</p> <p>A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development.</p>
<p>National Environmental Management: Biodiversity Act (Act No 10 of 2004)</p>	<ul style="list-style-type: none"> » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been 	<p>National Department of Environmental Affairs</p>	<p>Specialist flora and fauna studies are required to be undertaken as part of the EIA process. A specialist flora, fauna and wetland assessment has been undertaken for the proposed project.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations).</p> <ul style="list-style-type: none"> » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species. » Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed 		<p>A permit may be required should any listed plant species occur on site and are likely to be disturbed or destroyed as a result of the proposed development.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>protected species.</p> <p>The developer has a responsibility for:</p> <ul style="list-style-type: none"> » The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). » Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity. » Limit further loss of biodiversity and conserve endangered ecosystems. 		
<p>Conservation of Agricultural Resources Act (Act No 43 of 1983)</p>	<p>Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:</p> <ul style="list-style-type: none"> » <u>Category 1 plants</u>: are prohibited and must be controlled. » <u>Category 2 plants</u>: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken 	<p>Department of Agriculture</p>	<p>While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>to prevent their spread.</p> <p>» <u>Category 3 plants</u>: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.</p> <p>These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.</p>		<p>implemented.</p> <p>The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. However, none of these activities are expected to be undertaken on site.</p>
National Veld and Forest Fire Act (Act 101 of 1998)	<p>In terms of Section 21 the applicant would be obliged to burn firebreaks to ensure that should a veld fire occur on the property, that it does not spread to adjoining land.</p> <p>In terms of section 12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.</p> <p>In terms of section 17, the applicant must have such equipment, protective clothing and trained personnel for extinguishing fires.</p>	Department of Water Affairs	While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project. Due to the fire prone nature of the area, it must be ensured that the landowner and developer proactively manage risks associated with veld fires and provide cooperation to the local Fire Protection Agency.
National Forests Act (Act No 84 of 1998)	Protected trees: According to this act, the Minister may declare a tree, group of trees, woodland or a	Department of Environmental Affairs	A permit or license is required for the destruction of protected tree species

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>species of trees as protected. The prohibitions provide that ' no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.</p> <p>Forests: Prohibits the destruction of indigenous trees in any natural forest without a licence.</p>		<p>and/or indigenous tree species within a natural forest. No protected tree species were observed within or near the study area and it is highly unlikely that any protected tree species would be impacted by the development.</p>
<p>Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997</p>	<p>Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean ground level considered to be the lowest point in a 3km radius around such structure.</p> <p>Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified.</p> <p>Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft.</p> <p>Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.33 relates specifically to appropriate</p>	<p>South African Civil Aviation Authority (SA CAA)</p>	<p>This act will find application during the permitting and operational phase of the project. Appropriate marking on the turbine structures is required to meet the specifications as detailed in the CAR Part 139.01.33. An obstacle approval for the wind energy facility is required to be obtained from the CAA prior to the start of construction.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	marking of wind energy facilities.		
Hazardous Substances Act (Act No 15 of 1973)	<p>This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <ul style="list-style-type: none"> » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. <p>The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>	Department of Health	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
<p>National Road Traffic Act (Act No 93 of 1996)</p>	<p>The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.</p> <p>Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts.</p> <p>The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>	<ul style="list-style-type: none"> » Provincial Department of Transport (provincial roads) » South African National Roads Agency Limited (national roads) 	<p>An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include:</p> <ul style="list-style-type: none"> » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
<p>Development Facilitation Act (Act No 67 of 1995)</p>	<p>Provides for the overall framework and administrative structures for planning throughout</p>	<p>Provincial Department of Environmental Affairs and</p>	<p>The applicant must submit a land development application in the</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>the Republic.</p> <p>Sections 2- 4 provide general principles for land development and conflict resolution.</p>	<p>Development Planning (DEA&DP)</p>	<p>prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the DFA.</p>
<p>Astronomy Geographic Advantage Act (Act 21 of 2007)</p>	<p>» The Astronomy Geographic Advantage Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy;</p>	<p>National Department of Science and Technology</p>	<p>The site falls within the designated Sutherland Central Astronomy Advantage Area and about 50km from the South African Large Telescope (SALT). Input and comment from SALT and Astronomy Management Authority at the Department of Science and Technology are to be obtained during the public participation of the EIA process to ensure that potential negative impacts on the SALT operations are mitigated.</p>
<p>Subdivision of Agricultural Land Act (Act No 70 of 1970)</p>	<p>Details the subdivision of agricultural land and provisions under which the act is triggered. It also provides for the approval of such division by the Minister of Agriculture. Applies for subdivision of all agricultural land and long-term leasing of portions of agricultural land.</p>	<p>National Department of Agriculture, Forestry and Fisheries (DAFF) Provincial Departments of Agriculture and Environment - commenting authority.</p>	<p>Long-term leases on portions or subdivision of the site properties will require an approval of the Minister of Agriculture. An application to DAFF will need to be submitted detailing the areas to be subdivided or leased for the purposes of the proposed development. An application in terms</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
		Local Municipality – competent authority	of SALA will need to be undertaken and submitted following the issuing of an environmental authorization for the proposed project.
Provincial Policies / Legislation			
Western Cape Noise Control Regulations: PN 627 of 1998	» The control of noise in the Western Cape Province is legislated in the form of Noise Control Regulations promulgated in terms of section 25 of the Environment Conservation Act No. 73 of 1989.	Western Cape DEA&DP	In terms of Regulation 4 of the Noise Control Regulations: “No person shall make, produce or cause a disturbing noise (greater than 5 dBA), or allow it to be made, produced or caused by any person, animal, machine, device or apparatus or any combination thereof”. The NCR is not triggered by the proposed project.
Northern Cape Planning and Development Act, 1998 (Act 7 of 1998)	<ul style="list-style-type: none"> » The Northern Cape Planning and Development Act, 1998 (Act 7 of 1998) (NCPDA) provides for a single set of procedures and regulations to complement the accelerated development procedures as provided for in the Development Facilitation Act, 1995; » Ensures effective and co-operative planning and land development within the provincial and local spheres of the government of the Northern Cape province, 	Karoo Hoogland Local Municipality Northern Cape Provincial Planning –Commenting authority Provincial and National Departments of Agriculture – Commenting Authority	The development proposal of a wind energy facility implies a non-conforming land use on land zoned as Agriculture Zone I, with The primary use of agriculture. Hence, an application is made to change the zoning of land as per provisions in the applicable Scheme regulations for the properties in the Northern Cape.
Western Cape Land Use Planning Ordinance 15 of 1985	» The Provincial Government Western Cape promulgated Scheme Regulations PN 189/2011 dated 29 July 2011 in order to make the	Laingsburg Local Municipality	An application must be submitted to obtain the land use right of consent use in order to accommodate the

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	development of commercial wind and solar energy facilities possible on land zoned Agriculture Zone I.	Western Cape Department of Environmental Affairs and Development Planning – Commenting authority Provincial and National Departments of Agriculture – Commenting Authority	establishment of a wind energy facility on land zoned as Agriculture Zone 1 for the properties located in the Western Cape. The application will be submitted in terms of Section 4.6 of the Scheme regulations in terms of the Land Use Planning Ordinance, 1985 (Ord. 15 of 1985) promulgated in provincial notice, no PN 1048/1998 and as amended by provincial notice, no PN 189/2011.
The Nature and Environmental Ordinance 19 of 1974, (as amended by the Western Cape Nature Conservation Laws Amendment Act, Act 2 of 2000	The Nature and Environmental Ordinance 19 of 1974, (as amended by the Western Cape Nature Conservation Laws Amendment Act, Act 2 of 2000) defines the protection status of plants as follows: * “endangered flora” means flora of any species which is in danger of extinction and is specified in Schedule 3 or Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973; provided that it shall not include flora of any species specified in such Appendix and Schedule 4; (thus all Schedule 3 species) * “protected flora” means any species of flora specified in Schedule 4 or Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora,	CapeNature	Removal / relocation of protected plant / animal species require a permit to be obtained from CapeNature

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	<p>Washington, 1973; provided that it shall not include any species of flora specified in such Appendix and Schedule 3</p> <p>* "indigenous unprotected flora" means any species of indigenous flora not specified in Schedule 3 or 4;</p>		
<p>Northern Cape Nature Conservation Act, Act No. 9 of 2009</p>	<p>This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:</p> <ul style="list-style-type: none"> » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for 	<p>Provincial Department of Environmental Affairs - DENC</p>	<p>Permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project as there are a succulent plants species on the proposed development site. A permit is required to remove the plants.</p>

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	the Province.		
Western Cape Transportation Amendment Act of 1996	The provincial MEC may grant permit to undertake works within 200m of the published route upon receipt of the report assessing the potential impacts thereof.	Western Cape Department of Public Transport and Public Works	Any application for authorisation contemplated in the ECA and NEMA in respect of a 200m area on either side of a published route determination for a provincial road must be accompanied by a report that addresses the issues listed in that section of the Act.

ROLES AND RESPONSIBILITIES

CHAPTER 5

As the Proponent, Karreebosch Wind Farm (Pty) Ltd 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. Karreebosch Wind Farm (Pty) Ltd will retain various key roles and responsibilities during the construction of the wind energy facility. These are outlined below.

The following section outlines the roles and responsibilities of those involved in the proposed installation, operation and decommissioning of the wind energy facility. An organogram showing reporting structures is provided in Figure 5.1.

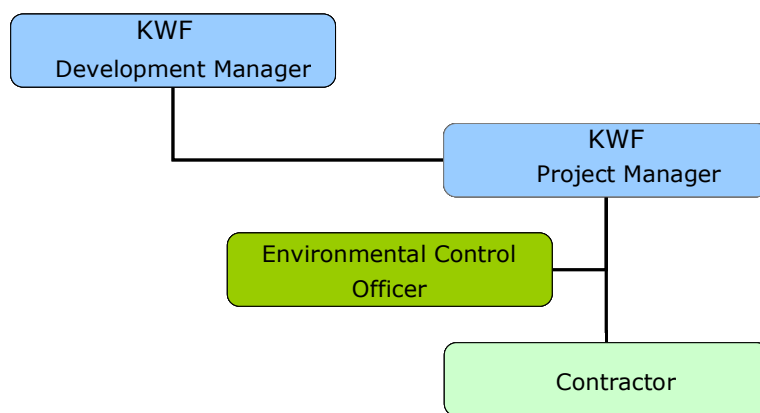


Figure 5.1.: Reporting structure

5.1. Karreebosch Wind Farm (Pty) Ltd (KWF)

KWF's Development Manager will have the ultimate responsibility for ensuring the measures outlined in the EMPr are delivered and that the measures are implemented by their contractors and subcontractors. In this respect the Development Manager will review and approve contractor plans for delivery of the actions contained in the EMPr during construction and ensure that during operation performance will be evaluated through monitoring and auditing.

a) Development Manager

The Development Manager's responsibilities will encompass the following:

- » Liaison with the project engineers to ensure that the Wind Farm is designed to meet all the specified environmental parameters and legal requirements as specified in the EMPr and Environmental Authorisation;
- » Authority to stop works in emergency situations;
- » Approval of method statements; and
- » Liaison with authorities.

The Project Manager, or any other person appointed to the role, is responsible for the implementation of the EMPr, and will report directly to the Development Manager on environmental, health and safety matters.

b) Project Manager

The Project Manager, or any other person appointed to the role, is the designated person responsible for the implementation of the EMPr and therefore the person responsible for managing the environmental issues that arise during the construction phase of the project.

The Project Manager's main role is to regularly inspect and manage the construction activities on site in order to ensure compliance with the EMPr. The Project Manager will liaise with the Environmental Control Officer (ECO) and Contractor and report to the Development Manager.

The Project Manager's responsibilities will encompass the following:

- » Training of contractors on environmental matters;
- » Inspect the site at least once every two weeks for the duration of the construction phase;
- » Management of the contractors in terms of the EMPr;
- » Review of contractor method statements and ensure alignment with the EMPr;
- » Reporting on environmental problems to the Development Manager;
- » Record keeping of:
 - * environmental incidents;
 - * contractors non-compliance to the EMPr; and
 - * contractor fines and penalties.
- » Making recommendations or implementing actions relating to a contractor's failure to comply with the EMPr, which may include enforcement of penalties and even contract termination and removal of contractor from the site;

- » Recommending the suspension of work activities where such activities contravene the EMPr requirements; and
- » The authority to stop works in emergency situations when the Development Manager is not available and construction activities seriously threaten the environment.

The Project Manager will also be responsible for implementing the community engagement plan. The Project Manager will be required to participate in community meetings that will be held in affected communities prior to, during and upon completion of construction.

During the construction phase an ECO will be responsible for ensuring the overall environmental and socio-economic objectives of the EMPr are met. Specialists such as palaeontologists, bird specialists etc. will be employed as required. When working on site, the ECO will report to the Project Manager.

5.2. Environmental Control Officer

KWF will appoint an independent Environmental Control Officer (ECO) prior to commencement of construction. The ECO will remain employed throughout the construction phase of the project until such time as rehabilitation is complete and the site is ready for operation. The ECO shall hold a relevant environmental degree or diploma and have experience in ECO work.

The ECO 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 EMPr.
- » 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).

5.3. Contractors and Site Personnel

During site preparation and construction, the contractor will be responsible for ensuring compliance with all relevant legislation as well as adherence to all environmental and socio-economic mitigation measures specified in the EMPr and the Environmental Authorisation (EA). The contractor is also responsible under the contract for managing the potential environmental, socio-economic, safety and health impacts of all contracted activities whether these are undertaken by themselves or by their subcontractors. The contractor has overriding responsibility for the activities of all direct staff and subcontractors.

Adherence to the provisions of the EMPr will be a condition of contract with the contractor. The contractor will need to demonstrate to KWF's satisfaction how compliance with the requirements of the EMPr will be met. The contractor will also be expected to demonstrate commitment to the EMPr at all levels in the contractor's management structure and will be required to identify individuals responsible for overall environment, socio-economic, safety and health management.

The contractor will be required to undertake regular environmental and socio-economic inspections and provide reports to KWF to monitor and evaluate performance against the measures and objectives established in the EMPr. In this

regard, the contractor's performance in complying with the EMPr will be monitored and audited by the ECO, Project Manager and Development Manager.

The Contractor should employ a Safety, Health and Environment (SHE) Representative 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. This representative should be suitably qualified and 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.

MANAGEMENT PLAN FOR THE WIND ENERGY FACILITY: PRE-CONSTRUCTION

CHAPTER 6

6.1. Goal for Pre-Construction (Planning and Design):

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.

6.2. 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 Karreebosch Wind Farm development site, areas of high sensitivity were identified (refer to Figure 1.2). The principle mitigation should be avoidance of identified sensitive areas as is proposed in terms of the recommended preferred layout for implementation.

Project component/s	<ul style="list-style-type: none">» Wind turbines» Access roads» Substations» Power lines» Laydown areas» Concrete batching plant» Ancillary infrastructure
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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 substation » Routing of power lines
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 ecology, avifauna and bat sites, as detailed within the EIA report and relevant appendices.	Engineering Design Consultant / turbine supplier Karreebosch Wind Farm (Pty) Ltd	Tender design, design review stage
Final infrastructure positions must be informed by detailed micro-siting surveys (geotechnical and specialist ecological, avifaunal and heritage surveys)	Engineering Design Consultant Karreebosch Wind Farm (Pty) Ltd Specialists	Tender design, design review stage
The final facility design should adhere to the recommended layout within the EIA (Figure 1.1) as far as possible. No infrastructure must be placed within no go areas and areas of high sensitivity	Engineering Design Consultant Karreebosch Wind Farm (Pty) Ltd	Tender design, design review stage
As far as possible, the number of roads should be reduced to the minimum possible and routes should also be planned to avoid areas of high sensitivity.	Engineering Design Consultant Karreebosch Wind Farm (Pty) Ltd	Tender design, design review stage
Make use of existing roads where possible when planning the access road layout for the facility.	Relevant specialists Engineering Design Consultant Karreebosch Wind Farm (Pty) Ltd	Design phase
Should the layout (or type of wind turbines used) change significantly during the final design, the new layout must be submitted to the Department for approval prior to implementation.	Karreebosch Wind Farm (Pty) Ltd	Design phase
Develop and implement a detailed stormwater management plan for hard/compacted surfaces (e.g. substation footprints) as part of the final design of the project (refer to Appendix B).	Karreebosch Wind Farm (Pty) Ltd	Design phase
A detailed 1:100 year floodline analysis must be undertaken prior to the final detailed design being completed	Karreebosch Wind Farm (Pty) Ltd	Design phase (post environmental authorization)

Mitigation: Action/control	Responsibility	Timeframe
<p>A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This shall include:</p> <ul style="list-style-type: none"> » Safety zones from residences, roads, right of way » Buffer zone to minimise electromagnetic interference with communication (eg microwave, radio and television transmissions) » Chemical ablution facilities » Approval from the South African Civil Aviation Authority and consultation with telecommunication providers to ensure that the wind farm does not interfere with the performance of aerodrome, radio communications, Navigation and Surveillance equipment. Copies of such approvals or comments must be kept onsite to ensure that the construction teams are aware of the conditions and obligations <p>Turbines must be spaced in accordance with minimum standards for minimising safety risks from each other, powerlines and other infrastructure.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design phase</p>
<p>Alternative sources of aggregate should be considered and should include the option of sourcing aggregate from nearby borrow pits (of similar soil and vegetation type ie quartzite) in preference to opening new quarries on the Karreebosch site. Consideration should be given to the option of several smaller borrow pits versus one or two large ones. The primary goal should be to use as much rock material from turbine foundations in preference to opening new borrow pits and to limit the quantity required from new borrow pits.</p> <p>Where importing aggregate is not feasible, several borrow pit locations should be selected based on the technical requirements of the project and an appropriately qualified botanist/ecologist should visit the sites to assess the site options.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design phase</p>

Mitigation: Action/control	Responsibility	Timeframe
<p>Borrow pit sites should be carefully selected to avoid rare edaphic habitats such as quartz or gravel patches which often contain rare dwarf succulents.</p> <p>Mining permit/license to be obtained for any borrow pits to be established for the project (if applicable).</p>		
<p>Obtain required abnormal load permits for transportation of project components to site.</p>	<p>Karreebosch Wind Farm (Pty) Ltd /contractor</p>	<p>Design phase</p>
<p>The noise emission specifications of wind turbine generators should be considered when selecting the equipment in order to ensure that noise impacts do not contravene the Noise Control Regulations.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design phase</p>
<p>Identify and record alien plant species present at the site from the ecological walk through survey undertaken.</p>	<p>Karreebosch Wind Farm (Pty) Ltd Ecological Specialist</p>	<p>Preconstruction</p>
<p>Undertake plant search and rescue within all development footprint areas (refer to Plant Search and Rescue Plan contacted in Appendix A).</p>	<p>Karreebosch Wind Farm (Pty) Ltd Ecological Specialist</p>	<p>Preconstruction</p>
<p>Plan the placement of lay-down areas, the concrete batching plant and temporary construction accommodation in order to avoid areas of high sensitivity and minimise vegetation clearing.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design phase</p>
<p>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.</p>	<p>Karreebosch Wind Farm (Pty) Ltd Lighting Engineer</p>	<p>Design</p>
<p>Aviation warning lights must be planned on turbine hub or such measures required by the Civil Aviation Authority.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design</p>
<p>Bird diverters should be planned on the power line on all cross-valley power lines to make the lines, and especially the earth-wires, more conspicuous.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design</p>
<p>Use bird safe structure to minimise the risk of electrocutions on the grid infrastructure components.</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Design</p>
<p>Investigate and establish the best mechanism and vehicle for the advancement of local development needs; specifically at the farm and local</p>	<p>Karreebosch Wind Farm (Pty) Ltd</p>	<p>Pre-construction</p>

Mitigation: Action/control	Responsibility	Timeframe
municipality levels. Projects for implementation should be identified in consultation with the local municipalities and community representatives.		
Identify potential opportunities for local businesses.	Karreebosch Wind Farm (Pty) Ltd	Tender and Design Review stage
Disseminate information to a local database of local BEE service providers and ensure that they are informed of relevant tenders and job opportunities.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction
Establish a procurement policy which sets reasonable targets for the procurement of goods and services from South African residents /suppliers, particularly local residents as far as possible.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction
A Transport Study must be undertaken at least three months prior to the commencement of construction in order to determine the most appropriate route from port to site.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction
A Traffic Management Plan should be developed for implementation during construction.	Karreebosch Wind Farm (Pty) Ltd EPC Contractor Transportation Contractors	Pre-construction
Obtain any additional environmental permits required (e.g. water use license, protected plant permits, etc.). Copies of permits/licenses must be kept onsite to ensure that the construction teams and contractors are aware of the conditions and obligations	Karreebosch Wind Farm (Pty) Ltd	Design phase
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction
Advise DEA of the commencement of activities as per the requirements/condition of the Environmental Authorisation (once issued).	Karreebosch Wind Farm (Pty) Ltd	Pre-construction
This EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Karreebosch Wind Farm (Pty) Ltd	Contractor 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
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	recommendations in Chapter 10 of the EIA report (Savannah Environmental, 2015).
Monitoring	» 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 » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
Potential Impact	» 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 C) 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.	Karreebosch Wind Farm (Pty) Ltd	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 employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
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.	Karreebosch Wind Farm (Pty) Ltd	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Effective communication procedures in place for all phases as required. » Fewer or no grievance/complaints remained unresolved in the schedule/record (to be kept on site).
Monitoring	<ul style="list-style-type: none"> » An incident reporting system should be used to record non-conformances to the EMPr. Grievance mechanism procedures should be implemented.

**MANAGEMENT PLAN FOR WIND ENERGY FACILITY:
 PRE-CONSTRUCTION & CONSTRUCTION**

CHAPTER 7

7.1. 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 farm 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, avifauna and bats on the site as well as on any archaeological and historical value the site may have, as determined by the EIA.

7.2. Objectives

In order to meet the goal outlined in Section 7.1, 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.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
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.	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
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.	Contractor	Duration of Contract
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 must 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/workers get 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: Appropriate management of the construction site and construction workers

Project Component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
Potential Impact	<ul style="list-style-type: none"> » Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	<ul style="list-style-type: none"> » Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Accommodation facilities. » Contractors 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"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
Only security personnel may be accommodated on site. Contractors and their employees should to be accommodated at existing accommodation facilities in the study area or within an appropriately sited construction camp.	Contractor	Pre-construction
Construction equipment will need to be stored at appropriate locations on site. The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the EIA studies and reflected on the site layout plan included within this EMP. No temporary site camps will be allowed outside the footprint of the development area.	Contractor	Pre-construction
Ensure that all personnel have the appropriate level of environmental awareness and competence to	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel (refer to Section 7.5). Records of all training undertaken must be kept.		
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	Contractor and sub-contractor/s	Duration of contract
Emergency numbers for the police, fire department, clinic and relevant responsible staff will be made available in conspicuous locations.	Contractor	Duration of contract
Provide appropriate numbers of chemical toilets within appropriate areas of the site for use by construction personnel.	Contractor	Site establishment, and duration of construction
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site.	Contractor	Site establishment, and duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas.	Contractor and sub-contractor/s	Duration of contract
Cooking/meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
Informal vending stations should not be allowed on or near the construction site.	Contractor	Construction
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Appropriate numbers of waste disposal bins should be provided within appropriate areas on the site. Ensure waste disposal facilities are maintained and emptied as and when required.	Contractor	Site establishment, and duration of construction
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrow pits. Solid waste (general waste) to be disposed of at the closest municipal landfill site.	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Slips of disposal to be retained as proof of responsible disposal		
No one may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Sub-contractors appointed by the Contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Construction
Provide opportunities for workers to go home over weekends where required and practically possible.	Contractor and sub-contractor/s	Construction
Water resources to be used sparingly and use not to exceed the resource potential or recharge rate. Contractor to keep detailed records of water quantities used.	Contractor	Pre-Construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan to be developed with emergency procedures in the event of a fire.	Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Information distributed as part of the existing HIV/Aids awareness campaigns should again be focused on and communicated to the local workforce.	Owner EPC Contractor	Construction
No vehicles or machinery are to be washed on site, outside of the designated areas.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » The construction equipment camps have avoided sensitive areas. » Ablution and waste removal facilities are appropriately maintained and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Contractors' Code of Conduct drafted before commencement of construction phase.
Monitoring	<ul style="list-style-type: none"> » Regular audits of the construction camps and areas of construction on site by the ECO.

	<ul style="list-style-type: none"> » Proof of maintenance of ablution and waste management facilities available on site. » An incident reporting system should be used to record non-conformances to the EMP. » Complaints investigated and, if appropriate, acted upon.
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OBJECTIVE 3: 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	<ul style="list-style-type: none"> » Construction activities associated with the establishment of the wind energy facility, including associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » 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. » There is also a potential challenge of local skills or business people not being able to meet the standard of service required for the facilities.
Activities/risk sources	<ul style="list-style-type: none"> » 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"> » Maximise the number of employment opportunities for local community members

Mitigation: Action/control	Responsibility	Timeframe
Employ as many workers (skilled, semi-skilled / low-skilled) from the local area/ nearby towns. The appointed contractor should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.	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"> » Karreebosch Wind Farm (Pty) Ltd 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 EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 4: 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	<ul style="list-style-type: none"> » 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.
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.
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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 contractor tender process for the construction phase.
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 construction phase of the conditions contained on the Code of Conduct.	Karreebosch Wind Farm (Pty) Ltd Contractor	Briefing session for construction workers held before they commence work on site.
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.	Karreebosch Wind Farm (Pty) Ltd 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. » 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"> » Karreebosch Wind Farm (Pty) Ltd 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-

	conformance to the EMP. » Public complaints register must be developed and maintained on site.
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OBJECTIVE 5: Noise control

Various construction activities would be taking place during the development of the facility and may pose a noise risk to sensitive receptors.

Project component/s	» Construction of infrastructure
Potential Impact	» Nuisance noise from construction activities affecting the surrounding community
Activity/risk source	» Any construction activities taking place within 500m from potentially sensitive receptors (PSR)
Mitigation: Target/Objective	» 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 outside of these times and/or 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: » 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	» No complaints received concerning noise.
Monitoring and Reporting	» Should a complaint about noise be reported, Karreebosch Wind Farm (Pty) Ltd 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 EMPr. » Public complaints register must be developed and maintained on site by the Contractor.

OBJECTIVE 6: 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	» Wind turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
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 (e.g. 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

Mitigation: Action/control	Responsibility	Timeframe
Disturbed areas must be re-vegetated using appropriate vegetation 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. » 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"> » Karreebosch Wind Farm (Pty) Ltd 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 EMPr. » Public complaints register must be developed and maintained on site.

OBJECTIVE 7: 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 » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
Potential Impact	<ul style="list-style-type: none"> » Erosion and soil loss » Negative impacts on drainage lines/watercourses » Sedimentation of drainage lines/watercourses » 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"> » Water 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 » Watercourse/drainage line road crossings » Roadside drainage ditches » Project related infrastructure, such as roads, 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 drainage lines and other watercourses as a result of the establishment of infrastructure » Minimal loss of vegetation cover due to construction related activities » No increase in runoff into drainage lines as a result of construction of project related infrastructure

Mitigation: Action/control	Responsibility	Timeframe
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas.	Contractor	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
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 must be implemented for erosion prone areas such as steep slopes and could include: 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 watercourses, 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
Implement stormwater management plan (Refer to Appendix B) and erosion management plan (Appendix D) during construction	Contractor	Construction
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 appropriately disposed of or re-used in the construction process.	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
Spill kits to be kept on active parts of the construction site & at site offices.	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 8: 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 of 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

Mitigation: Action/control	Responsibility	Timeframe
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 50m away from drainage lines and regularly serviced	Contractor	Construction
Concrete batching plants and stockpiles to be located more than 500m away from drainage lines.	Contractor	Construction

Performance Indicator	» No impacts on water quality and water quantity within affected drainage lines
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 9: 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 (refer to alien plant management plan contained in Appendix E and Open Space Management Plan contained in Appendix F).

Project component/s	All infrastructure and activities which result in vegetation loss or clearing including: <ul style="list-style-type: none"> » Wind turbines » Access roads » Substations » Power lines » Laydown areas
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	<ul style="list-style-type: none"> » Concrete batching plant » Ancillary infrastructure
Potential Impact	<ul style="list-style-type: none"> » Loss of plant cover leading to erosion » Loss of faunal habitat » Loss of specimens of protected plants
Activity/risk source	Vegetation clearing for the infrastructure establishment and temporary construction areas
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To reduce the footprint and impact on terrestrial environment » To reduce the impact on protected and sensitive plant species

Mitigation: Action/control	Responsibility	Timeframe
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas.	Contractor	Construction
Wetlands (existing), forest edges, riverine fringe vegetation and potentially unstable areas must remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities – workers entering these zones for any reason other than rehabilitation work must be disciplined.	Contractor	Construction
Minimise vegetation clearance as far as possible.	Contractor	Construction
Clearing of vegetation must be undertaken as the work front progresses. Mass clearing should not be permitted unless the entire cleared area is to be rehabilitated immediately.	Contractor	Construction
Destruction or translocate affected individuals of protected species must be undertaken in accordance with appropriate permit.	Contractor	Construction
Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3 except where approved in terms of the final layout for the facility	Contractor	Construction
Ensure vehicle movement is restricted to designated roads.	Contractor	Construction
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) (refer to Appendix E).		
Immediately control any alien plants that become established using registered control methods. Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Contractor	Construction
Revegetate disturbed areas as soon as possible after construction is completed in an area. Should revegetation not be possible immediately, the cleared areas must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Contractor	Construction
A site rehabilitation programme should be compiled and implemented (refer to Appendix G).	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Vegetation loss must be restricted to infrastructure footprint » Low impact on protected plant species » Destruction or translocate affected individuals of protected species undertaken in accordance with appropriate permit.
Monitoring and Reporting	<ul style="list-style-type: none"> » ECO to monitor construction to ensure that: <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 » Contractor's SHE Officer to document alien plant distribution and control measures applied within the site on a 3-monthly basis

OBJECTIVE 10: Protection of fauna & avifauna

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

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations
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	<ul style="list-style-type: none"> » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats » Disturbance of fauna and 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
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
Minimise the destruction of riparian habitat in the valley bottoms when upgrading existing tracks to allow heavy vehicle access	Contractor	Site establishment & duration of contract
A site rehabilitation programme should be compiled and implemented (refer to Appendix F).	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"> » Wind turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
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: To minimise traffic related impacts

A large amount of traffic will be generated during the construction phase. The following activities will probably occur during the construction phase:

- » Construction of the internal access roads,
- » Stripping and stockpiling of topsoil,
- » Excavation and construction of the foundations for the wind turbines,
- » Construction of the operations building,
- » Erection/Assembly and disassembly of the cranes
- » Assembly of the towers, nacelles and blades,
- » Trenching for cabling and
- » Reinstatement of the site.

The tower foundations are large reinforced concrete footings. It is assumed that the material removed during excavation will be utilised within the site to create hardstand areas for the cranes, roads and in reinstating the site after construction. It is assumed that the concrete will be mixed on site and the raw materials will be transported to the site via the existing road network.

Project component/s	Traffic related impacts on existing road infrastructure and property owners situated along the routes to be travelled and those surrounding the construction site, as well as possible impact on local road users.
Potential Impact	Impact of abnormal sized vehicles and general heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals
Activities/risk sources	Construction vehicle movement Speeding on local roads Degradation of local road conditions
Mitigation: Target/Objective	Minimise the impact of the increase in abnormal and heavy vehicles on existing infrastructure, property owners, animals and road users.

Mitigation: Action/control	Responsibility	Timeframe
Develop and implement a traffic management plan (Refer to Appendix H)	Karreebosch Wind Farm (Pty) Ltd, Contractor	Pre-construction Construction
All regulations and legislation pertaining to the use of provincial and local roads by abnormal vehicles to transport the wind turbines should be noted and adhered to.	Karreebosch Wind Farm (Pty) Ltd, Contractor and relevant government departments (national and	Pre-construction Construction

Mitigation: Action/control	Responsibility	Timeframe
	provincial)	
Speeding of construction vehicles should be avoided at all costs.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction
Property owners of the surrounding farms should at all times have proper access to their properties.	Contractor	Construction
The local gravel access roads frequently used by construction vehicles should regularly be graded to limit the degradation of the road surface.	Contractor	Construction
Signage must be used for public road safety along the R354 during the transport and construction phases.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » Property owners have access to their properties at all times. » No traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. with regards to the speeding of heavy vehicles).
Monitoring	<ul style="list-style-type: none"> » Karreebosch Wind Farm (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 13: 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 » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant
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	» Ancillary infrastructure
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 banded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any spills will receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and 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	Contractor	Duration of

Mitigation: Action/control	Responsibility	Timeframe
accordance with the relevant legislation and regulations.		contract
Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and licensed waste disposal sites.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste 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	Contractors	Erection: during site establishment Maintenance: for duration of

Mitigation: Action/control	Responsibility	Timeframe
burnt or buried on site.		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
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
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	<ul style="list-style-type: none"> » 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 14: 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 turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary 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

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 firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract

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 15: 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 commences. » 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.

7.4. Detailing Method Statements

OBJECTIVE 16: 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.

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

OBJECTIVE 17: 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

This describes the manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks that must be dealt with in order to avoid pollution or the degradation of the environment"

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 (or any environmental risk which may result from their work), and how they are to be implemented (in order to avoid pollution or the degradation of the environment).
- » 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.
- » Ensuring risks are dealt with in order to avoid pollution or the degradation of the environment;
- » 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.

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

OBJECTIVE 18: 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, Karreebosch Wind Farm (Pty) Ltd must determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager must 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.

**MANAGEMENT PLAN FOR WIND ENERGY FACILITY:
 REHABILITATION OF DISTURBED AREAS**

CHAPTER 8

8.1. 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.

8.2. Objectives

In order to meet the goal outlined above, 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. Refer to revegetation and rehabilitation plan contained in Appendix G.

Project component/s	<ul style="list-style-type: none"> » Wind turbines » Access roads » Substations » Power lines » Laydown areas » Concrete batching plant » Ancillary infrastructure
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	Contractor	in Duration of

Mitigation: Action/control	Responsibility	Timeframe
and implemented (refer to Appendix G).	consultation with Specialist	contract
All temporary facilities, equipment and waste materials must be removed from site and appropriately disposed of.	Contractor	Following execution of the works
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.	Karreebosch Wind Farm (Pty) Ltd 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.	Karreebosch Wind Farm (Pty) Ltd 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.

MANAGEMENT PROGRAMME FOR THE WIND ENERGY FACILITY:

OPERATION

CHAPTER 9

An environmental manager should be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats, including wetlands. 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.

9.1. 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.

9.2. 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» Power lines» Operations and service building
Potential Impact	<ul style="list-style-type: none">» Hazards to landowners and public

Activities/risk sources	» Uncontrolled access to the wind energy facility and associated infrastructure.
Mitigation:	» To secure the site against unauthorised entry
Target/Objective	» To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Where necessary to control access, fence and secure access to the site and entrances to the site.	Karreebosch Wind Farm (Pty) Ltd	Operation
Post information boards about public safety hazards and emergency contact information	Karreebosch Wind Farm (Pty) Ltd	Operation

Performance Indicator	» Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring and Reporting	» 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	» Areas requiring regular maintenance » Route of the security team » Areas disturbed during the construction phase and subsequently rehabilitated at its completion
Potential Impact	» 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	» Movement of employee vehicles within and around site.
Mitigation: Target/Objective	» 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.	Karreebosch Wind Farm (Pty) Ltd	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Karreebosch Wind Farm (Pty) Ltd	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	Karreebosch Wind Farm (Pty) Ltd / Specialist	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Karreebosch Wind Farm (Pty) Ltd	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified	Karreebosch Wind Farm (Pty) Ltd /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 and documentation of alien species presence and clearing actions » Annual monitoring and documentation 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 » Power lines
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 » Electrocution and collision with the power line
Activity/risk source	<ul style="list-style-type: none"> » Spinning turbine blades » Substation » Power lines
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 (refer to Appendix I).	Karreebosch Wind Farm (Pty) Ltd / environmental manager	Operation
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
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

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.
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	<ul style="list-style-type: none"> » 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.
<p>Monitoring and Reporting</p>	<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 too, 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.	Karreebosch Wind Farm (Pty) Ltd	Operation and maintenance
Undertake regular maintenance of light fixtures.	Karreebosch Wind Farm (Pty) Ltd	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, as per the condition of approval by the Civil Aviation Authority. » The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.

OBJECTIVE 5: 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 facility » Substations » Power lines
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Potential Impact	<ul style="list-style-type: none"> » 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.	Karreebosch Wind Farm (Pty) Ltd	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Karreebosch Wind Farm (Pty) Ltd	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.	Karreebosch Wind Farm (Pty) Ltd	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 bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Karreebosch Wind Farm (Pty) Ltd	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Karreebosch Wind Farm (Pty) Ltd / 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. 	Karreebosch Wind Farm (Pty) Ltd	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Karreebosch Wind Farm (Pty) Ltd	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of	Karreebosch Wind Farm (Pty) Ltd	Operation

Mitigation: Action/control	Responsibility	Timeframe
separately.		
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Karreebosch Wind Farm (Pty) Ltd	Operation
No waste may be burned or buried on site.	Karreebosch Wind Farm (Pty) Ltd	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. » 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 6: Maximise local employment and business opportunities during operation

Limited 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.	Karreebosch Wind Farm (Pty) Ltd	Prior to commencement of operation
Develop training and skills transfer programme for local personnel.	Karreebosch Wind Farm (Pty) Ltd	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 7: 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	<ul style="list-style-type: none"> » Operation and maintenance of the wind energy facility and associated infrastructure.
Potential Impact	<ul style="list-style-type: none"> » 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	<ul style="list-style-type: none"> » The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » 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.	Karreebosch Wind Farm (Pty) Ltd	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Karreebosch Wind Farm (Pty) Ltd	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Karreebosch Wind Farm (Pty) Ltd	Operation
Fire breaks should be established where and when	Karreebosch Wind	Operation

Mitigation: Action/Control	Responsibility	Timeframe
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.	Farm (Pty) Ltd and landowners	
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.	Karreebosch Wind Farm (Pty) Ltd	Operation
Contact details of emergency services should be prominently displayed on site.	Karreebosch Wind Farm (Pty) Ltd	Operation

Performance Indicator	<ul style="list-style-type: none"> » Firefighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring and Reporting	<ul style="list-style-type: none"> » Karreebosch Wind Farm (Pty) Ltd must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 8: 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	<ul style="list-style-type: none"> » Increase in traffic to and from site could affect daily living and

Sources	<p>movement patterns of surrounding residents.</p> <ul style="list-style-type: none"> » 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. » Communication with landowner and local farming bodies regarding operational activities. » 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.	Karreebosch Wind Farm (Pty) Ltd	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Karreebosch Wind Farm (Pty) Ltd	Operation
Local roads should be maintained to keep the road surface up to a reasonable standard.	Karreebosch Wind Farm (Pty) Ltd	Operation
Limit the development of new access roads on site.	Karreebosch Wind Farm (Pty) Ltd	Operation
Ensure on-going communication with the landowners of the site in order to ensure minimal impact on farming activities	Karreebosch Wind Farm (Pty) Ltd	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.
Monitoring and reporting	<ul style="list-style-type: none"> » Karreebosch Wind Farm (Pty) Ltd should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: DECOMMISSIONING

CHAPTER 10

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.

10.1. 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.

10.2 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.

10.2 Rehabilitation of the Site

In order to minimise the extent of rehabilitation activities required during the decommissioning phase, Karreebosch Wind Farm (Pty) Ltd must ensure that constant effort is applied to rehabilitation activities throughout the construction, operation and maintenance phases of the project.

In decommissioning the facility, Karreebosch Wind Farm (Pty) Ltd 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 decommissioning 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 8) is also relevant to the decommissioning of sections of the proposed distribution line and must be adhered to.

**REVISION OF THE
ENVIRONMENTAL MANAGEMENT PROGRAMME**

CHAPTER 11

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 measures 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 SEARCH AND RESCUE PLAN AND
PLANT PROTECTION PLAN

PLANT SEARCH AND RESCUE PLAN AND PLANT PROTECTION PLAN

The purpose of the plant rescue plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Karreebosch Wind Farm on listed and protected plant species and their habitats.

1. Background & Identification of Species of Conservation Concern

The ToPS (Threatened and Protected Species) regulations provide for the regulation of activities which may directly or indirectly impact threatened and protected species. Such species are identified under NEMBA as well as by the National Red Data List of Plants. At a provincial level, the Western Cape Nature Conservation Laws Amendment Act (2000), also provides lists of species which are protected within the province. Species listed under the National Red Data List of Plants as well as those protected under the provincial legislation must be specified on permit applications required for site clearing.

According to the SIBIS database nearly 1000 indigenous species are known from the quarter degree squares 3220 CD and DC. This is an exceptionally high number of species given the relative aridity of the area. This includes 26 threatened species and an additional 44 species of lower conservation concern. The quarter degree squares admittedly cover a larger area than the study area and includes a variety of habitats, some of which are not found in the study area. This serves to illustrate the high species richness of the area and high potential impact of the development on plant species of conservation concern. Species listed as Threatened (CR, EN and VU) are regulated under the Biodiversity Act (Act No. 10 of 2004), by the Threatened and Protected Species Regulations (ToPS) promulgated under the Act. Any activities which have a direct or indirect impact on ToPS-listed species require a ToPS permit.

Species of conservation concern that were observed at the site include *Brunsvigia josephinae* (VU), *Duvalia parviflora* (VU), *Romulea hallii* (VU), *Adromischus mammillaris* (EN), *Pelargonium torulosum* (Rare), *Eriosephalus grandiflorus* (Rare) and *Drimia altissima* (Declining). Of significance, is that *Drimia uranthera* (VU) was also observed at the site. This species has not been recorded from the area before, being known from the Little Karoo near Ladismith. This species is relatively obscure, but was relatively common on clay soils in the lowlands of the site, and is not likely to be significantly affected by the development given its habitat largely outside of the development footprint.

Species which can be confirmed present within the development footprint include *Romulea hallii*, which occurs along the eastern ridges, *Eriosephalus grandiflorus* which is fairly common in areas of well weathered shale gravel along the ridges in the east and the west, and *Pelargonium torulosum* which occurs among rocks, usually on rocky

outcrops along the ridges. Significant populations of these species occur within the area affected by the development and preconstruction checks and walk-through during the flower season with additional mitigation and avoidance measures would be a critical measure to ensure a reduced impact on these species.

Apart from the species listed above by the South African Red Data list of Plants a number of genera are listed in their entirety as protected by the Western Cape Nature Conservation Laws Amendment Act of 2000. Of particular relevance to the current site, are the species within the following families and genera: Amaryllidaceae, Asclepiadaceae, Iridaceae, Aloe except *Aloe ferox*, Haworthia, Lachenalia, Mesembryanthemaceae, Orchidaceae, Anacampseros, Rutaceae and Diascia. Although the affected species within these families and genera may not be rare, they are protected under the provincial legislation and will need to be specified on any clearing permit applications for the site.

2. Mitigation and Avoidance Options

Ideally, the development should strive to avoid impact to listed plant species through micro-siting of the roads and turbines. This can be informed by the specialist ecological walk through survey which is recommended to take place prior to the commencement of construction. Due to various other constraints, avoidance may not always be possible and some impact on listed plant species may be inevitable. Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well. An appropriate permit must be obtained from the relevant conservation authorities prior to undertaking any search and rescue operations, or prior to destruction of protected plant species.

3. Rescue and Protection Plan

Pre-construction

Before construction commences at the site, the following actions should be taken:

- » Walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This would need to happen during the peak flowering season at the site which depending on rainfall is likely to be during September.

- » Compilation of a walk-through report which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. As well as contains a full list of localities where listed species occur within the development footprint and the number of affected individuals in each instance; and
- » Search and rescue operation of all listed species within the development footprint that cannot be avoided. Where appropriate, affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes.
- » Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- » Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

Construction

- » The ECO is to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site;
- » Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site under the supervision of the ECO;
- » Many listed species are also sought after for traditional medicine or by collectors and so the ECO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed; and
- » The ECO should monitor construction activities in sensitive habitats such as near rivers and wetlands carefully to ensure that impacts to these areas are minimized.
- » ECO to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place.
- » Ensure that lay down areas, construction camps and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate,

Operation

- » Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers; and

- » The collecting of plants or their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.
- » No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purpose without a valid permit.

APPENDIX B:
STORMWATER MANAGEMENT AND
EROSION CONTROL

STORM WATER MANAGEMENT AND EROSION CONTROL

1. INTRODUCTION

Within the project site there are numerous small non-perennial watercourses that flow from areas of high ground into and along valleys within the site. Tributaries of two perennial rivers, the Wilgebosrivier and Furrowrivier flow from within the site area to beyond in the north and south of the site respectively. Other perennial watercourses that are located in the areas surrounding the site include the following:

- » Kerekloofrivier (approximately 2 km west of site);
- » Matjiesfontein se Kloof (approximately 5 km west of the site); and
- » Roggeveldrivier (approximately 5 km east of the site).

Given the size of the site and varied topography it is likely that the site is located within a number of different watersheds. A number of farm dams are also located within the site area and beyond. It is, therefore important that storm water is appropriately managed to ensure potential impacts to these water bodies are mitigated.

Storm water management measures are outlined below, however, the storm water management plan must be updated and refined once the construction/ civil engineering plans have been finalised.

2. ROAD DRAINAGE

It has been assumed that internal roads will have a gravel surface. To assist with the storm water run-off, gravel roads should be graded and shaped with a 2 percent crossfall where technically feasible within the limitation of the turbine component transport requirements (the slope of a road from the centre toward the shoulder or gutter on either side) back into the slope, allowing storm water to be channelled in a controlled manner towards the natural drainage lines. Where proposed roads intersect with natural, defined drainage lines, a suitably sized pipe culvert or drive through causeways must be installed/ constructed and should take into account the hydrology criteria for a major storm as outlined below.

A minor storm design period should be used to determine the size of channels. A return period of 1:5 years is applicable in this instance. The major storm occurrence i.e. 1:25 year, 1:50 & 1:100 year return should be used to calculate culverts in defined drainage lines and to determine flood levels where necessary. A detailed 1:100 year floodline analysis must be undertaken prior to the final detailed design being completed.

Construction monitoring must be undertaken by the ECO as part of the routine site visits. Operational monitoring must be undertaken by the ECO or Environmental

Manager on a bi-monthly basis throughout the first year after construction (or more frequently after storm or extended rainfall events to check for erosion). After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks. Where roads traverse rivers and drainage lines, the sites should be monitored to ensure that the presence of the road is not resulting in erosion or the deposition of large amounts of silt.

3 EROSION PREVENTION

The preparation of the site for the establishment of turbines, underground cables, access roads, lay-down areas, substation site and operation and maintenance building during the construction phase will result in vegetation clearance, removal of topsoil and subsoil to varying depths and soil compaction. Areas cleared of vegetation are prone to erosion by wind or rain and although the area directly affected may be small, the effects of potential soil erosion and increased sediment load in surface runoff may extend to other areas.

Erosion prevention measures and monitoring is key to ensure this potential impact is managed effectively. Specific recommendations include:

- » Establishment of an erosion monitoring system to record the location and extent of all erosion sites in the vicinity of the roads and wind turbines. The results should be recorded and stored in manner that they can be used in a GIS.
- » The erosion monitoring system should record the measures taken to address existing erosion problems, their success and the occurrence of new erosion sites.
- » Sweeps specifically for erosion problems should be made after large storms or heavy rainfall events as these are likely to be the trigger events for erosion and control will be more easily affected while the problem is still of a small extent and low severity.
- » Sweeps should be more frequent in the first year of construction as this is when the majority of problems are likely to manifest as the soil will still be loose and unvegetated. Particular attention should be paid to roads and other disturbed areas on slopes or vulnerable soil types.
- » In terms of frequency, erosion should be checked at least quarterly, more often in the rainy season.

Operational monitoring can be undertaken by the ECO or Environmental Manager on a monthly basis throughout the first year after construction (or more frequently after storm or extended rainfall events to check for erosion). After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks.

4 BORROW PITS

Borrow pits that may be developed on site will produce overburden and will expose soil, leaving it vulnerable to potential erosion. Due to the exposed soil and rock faces, silt laden run off can be expected from within the confines of the borrow pit and also from the access track leading down to the borrow pit. The following measures must be put in place to reduce erosion and the impact on surface water bodies.

- » Consideration should be given to the location of any aggregate or overburden stockpiles such that erosion and run off is limited.
- » Measures should be put in place to minimise erosion and run off from the overburden stockpiles.
- » A silt fence should be installed on the down-gradient side of the stockpile to reduce silt load.
- » An up-gradient cut off ditch should be installed around the edge of stock pile, above the borrow pit, in order to collect up-gradient surface water runoff and divert water runoff from eroding the base of the stock pile. This will eliminate or reduce the flow of water onto the exposed rock and soil faces and into the worked quarry floor, thereby reducing the amount of potential silt laden run off.
- » Clean runoff water from cut off ditches should be discharged into an area of vegetation for dispersion or infiltration. Silt fencing and anchored straw bales may be required at the discharge point in order to alleviate flow and aid in flow dispersion across a wider area of vegetation to prevent potential scour effects.
- » Silt laden run off will be captured and directed via berms or ditches towards specially constructed sediment control structures. Sediment control structures may comprise a series of settlement ponds with additional incorporated filtration measures, where required.

5 TURBINE FOUNDATIONS AND CRANE HARDSTANDING AREAS

Large areas of soil may be exposed during the excavation of turbine foundations and on the associated hardstanding areas. Prior to commencement of each foundation excavation, the Contractor will assess the local gradient and the potential risk of silt laden run-off exiting the base area and design appropriate sediment control and silt mitigation measures accordingly. The standard mitigation measures outlined below must be implemented at each excavation:

- » Overburden must be stripped and stored on the up-gradient side of the turbine base and crane hardstanding. If necessary, a silt fence should be installed on the down-gradient side of the stockpile.
- » An up-gradient cut off ditch should be installed around the edge of the stock pile above the deep excavation in order to collect up-gradient surface water runoff and divert water runoff from eroding the bund foot. This will eliminate or reduce the flow

of water into the deep excavation and reduce the amount of potential silt laden run off.

- » Diversion dams / berms will be constructed accordingly in order to channel silt-laden run-off water into the 'dirty' water drainage system for discharge into a suitable sediment control structure.

6 CONSTRUCTION COMPOUNDS, SUBSTATION AND CONTROL BUILDINGS

During construction works, large areas of soil may be exposed at the site of the construction compounds and substation/ control building construction footprints. As with borrow pits, clean up-slope run off and run off from the exposed construction area will be kept separate and appropriate silt mitigation measures will be deployed.

APPENDIX C:
GRIEVANCE MECHANISM FOR PUBLIC
COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

The IFC (International Finance Corporation) Performance Standards require that any project that is likely to generate adverse environmental and social impacts on Affected Communities, have in place a project level grievance mechanism. Such a mechanism should be made readily accessible to the Affected Communities and allow for the receiving, addressing, recording and documenting of complaints and communications from external stakeholders. Grievance mechanisms are an important part of IFC's approach for the requirements related to community engagement by clients under the Policy and Performance Standards on Social and Environmental Sustainability.

Local people need a trusted way to voice and resolve concerns linked to a development project, and companies need an effective way to address community concerns. A locally based grievance resolution mechanism provides a promising avenue by offering a reliable structure and set of approaches where local people and the company can find effective solutions together. The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that:

- » Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting
- » Builds trust as an integral component of broader community relations activities
- » Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

A grievance mechanism provides a way to reduce risk for projects, offers communities an effective avenue for expressing concerns and achieving remedies and promotes a mutually constructive relationship.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person.

The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.

- The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.
- The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
- Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.
- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned;
- In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the

Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.

- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator will prepare a draft report that summarizes the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX D:
EROSION MANAGEMENT PLAN

EROSION MANAGEMENT PLAN

1. PURPOSE

The purpose of the Karreebosch Wind Farm erosion management plan plant is to implement avoidance and mitigation measures to reduce the erosion potential and likely impact of erosion associated with the construction and operational phases of the proposed Karreebosch Wind Farm.

2. SCOPE & LIMITATIONS

This plan is intended at introducing measures aimed reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore issues such as the presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

3. RELEVANT ASPECTS OF THE SITE

The site occurs in a mountainous region and while there are currently numerous access roads through the site, the majority of these are in low-lying areas. The turbines occur along the higher-lying ridges of the site and new access roads will be required across a portion of the site. The ridges themselves are largely of a rocky or gravel nature and erosion risk in these areas is generally quite low. In addition, the tops of the ridges are quite flat and the majority of turbines would be located in areas of locally flat topography. The major risk factor in terms of erosion potential at the site is therefore the access roads and other infrastructure such as power lines and underground cabling trenches, which must traverse lowland areas and steep slopes. On account of the mountainous topography of the site, some of the access road routes would need to traverse some steep slopes as well as cross numerous drainage lines. In such areas, the risk of erosion problems and secondary ecological impact is very high and mitigation measures should pay specific attention of these susceptible areas.

4. BACKGROUND

4.1. Types of Erosion

Erosion comes in several forms, some of which are not immediately apparent. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the “bomb blast” effect of raindrop impact. Soil particles can be blasted more than a metre into the air.

Sheet erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator.

Rill erosion

This is the removal of soil from the surface whereby small channels or rills up to 300mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc.

Gully erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed.

4.2. Promoting Factors

Rainfall

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. The erosion potential of rainfall is dependent on its geographical location. Rainfall within the winter-rainfall region is generally less erosive than rainfall within the summer rainfall region of South Africa.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and steepness of slope

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases.

Soil surface cover

Soil surface covers such as vegetation and mulches protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion.

5. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion and sediment control during and after construction at the site should be to:

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

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints;
2. Plan and integrate erosion and sediment control with construction activities;
3. Minimise the extent and duration of disturbance;
4. Control stormwater flows onto, through, and from the site in stable drainage structures;
5. Use erosion controls to prevent on-site damage;
6. Use sediment controls to prevent off-site damage;
7. Control erosion and sediment at the source;
8. Stabilise disturbed areas promptly; and
9. Inspect and maintain control measures.

5.1. On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- » Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional summer thunder storms can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year;
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas;
- » Phased construction and progressive rehabilitation are important elements of the erosion control strategy; and
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.
- » Roads should be constructed and routed in manner which minimises their erosion potential. Roads should therefore follow the contour as far as possible and roads parallel to the slope direction should be avoided as much as possible.
- » All roads should have water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
- » Regular monitoring of the site (minimum of twice annually) for erosion problems is recommended, particularly after large summer thunderstorms have been experienced.
- » Any erosion problems observed should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » All bare areas should be revegetated with locally occurring species, to bind the soil and limit erosion potential.
- » Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring to assess the success of the remediation.
- » Silt traps should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Topsoil should be removed and stored separately and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- » Phased development and vegetation clearing so that cleared areas are not left unvegetated and vulnerable to erosion for extended periods of time.
- » Construction of gabions and other stabilisation features on steep slopes to prevent erosion.

- » Reduced activity at the site after large rainfall events when the soils are wet. No driving off of hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.

5.2. Specific Recommendations to Reduce Erosion Potential and Degradation of Drainage Systems

Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- » Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far as possible, with existing, natural channels.
- » All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.
- » Significant wetlands should be avoided. There is sufficient space at the site and flexibility in the design constraints of the access roads, such that it should not be necessary to traverse wetlands.

Runoff Concentration

The increase in hardened surfaces associated with roads and turbine service areas, will lead to an increase in the volumes and velocities of flows generated from the hardened surfaces during rainfall events.

- » Runoff from road surfaces is usually channeled of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom.

- » Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- » Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- » The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.
- » Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- » Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

Existing Erosion

In some parts of the site, erosion problems are already present. In these areas particular precautions should be exercised to avoid exacerbating the existing problems. In the long-term these areas should be rehabilitated as part of the overall erosion management plan for the site. In cases where severe erosion is already present the following broad-scale measures are recommended:

- » The advice of a wetland ecologist, working in association with an engineer should be sought regarding rehabilitation / remediation activities – these may include the construction of gabions to halt head cut erosion and further loss of wetlands, as well as planting of disturbed areas.
- » The design of the existing drainage system should be addressed, and incorrect culvert or outlet alignment, as and downstream flow velocity, addressed through changes in design.
- » The eroded area should be carefully monitored for up to three years after remediation, and until a new stable state is achieved in wetland structure and function.
- » Eroded areas should be protected from grazing and trampling by livestock during their re-establishment phases.

APPENDIX E:
ALIEN INVASIVE MANAGEMENT PLAN

ALIEN INVASIVE PLANT MANAGEMENT PLAN

1. Overall Objective

Manage alien and invasive plant species during the construction and operation of the Karreebosch Wind Energy Facility, through the implementation of an alien invasive species management and control programme.

2. Problem Outline

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that landusers clear Declared Weeds from their properties and prevent the spread of Declared Invader Plants on their properties. A list of declared weeds and invader plants is attached as Appendix E.

3. Current Status of Alien Plants at the Site

The site was visited during the field assessment for the EIA of the proposed development as well as several times thereafter for related purposes. The majority of time was spent along the ridgelines and higher-lying parts of the site where the turbines will be located. These site visits revealed that the higher-lying parts of the site are currently in good condition with regards to the presence of alien species and very few alien species were observed in these areas. This can be ascribed to the low levels of disturbance in these areas. The disturbance associated with the construction of the facility will however encourage the invasion of alien species into these previously near-pristine areas. Some alien invasion is inevitable and regular alien clearing activities would be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and turbine service areas are likely to remain foci of alien plant invasion. This impact is highly likely to occur during the operational phase of the development. The construction phase is considered too short for significant alien plant invasion to occur despite the fact that many alien species are likely to be imported at this point. The lowlands of the site on the other hand have been more heavily impacted by intensive agriculture and human activity and a variety of alien species were observed present within these areas. Species observed include:

- » *Bromus spp.*
- » *Salsola kali*

- » *Malva parviflora*
- » *Prosopis glandulosa*
- » *Atriplex inflata*

Although the presence of these species within the lowlands is not directly of concern to the development of the wind energy facility, these are the species that are likely to become a problem within the disturbed areas of the site on account of seed input from these adjacent areas.

4. Vulnerable Habitats

The susceptibility of the site to alien invasion is not homogenous and specific environments and habitats can be singled out as being more vulnerable to invasion. This includes:

- » Riparian areas and wetlands
- » Disturbed areas which receive runoff
- » Construction camps experiencing prolonged use
- » Lay down areas experiencing prolonged use

These areas are likely to require specific attention and repeated alien clearing may be required to keep these areas clear of invasives.

5. Specific Management Objectives:

- » Although the wind energy facility includes a number of different landowners, the alien plant management plan should be inclusive and cover all the properties involved.
- » Ensure alien plants do not become dominant in parts or the whole landscape.
- » Initiate and implement a monitoring and eradication program for alien and invasive species.
- » Regular monitoring for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring.
- » Control alien and invasive species dispersal & encroachment. When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.
- » Clearing methods should themselves aim to keep disturbance to a minimum.
- » No planting or importing any alien species to the site for landscaping, rehabilitation or any other purpose.
- » Promote the planting of indigenous species.

6. General Clearing & Guiding Principles

- » Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during preconstruction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the preconstruction reporting requirements for the site.
- » The plan should include a map showing the alien density & indicating dominant alien species in each area.
- » The lighter infested areas should be cleared first (with young/ immature, less dense trees) to prevent the build-up of seed banks.. In the case of alien species confined to rivers, it is ideal to start in the headwaters and then move downstream, thereby removing the source of re-infestation.
- » Dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are at the moment.
- » Collective management and planning with neighbours may be required as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- » All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.
- » Clearing methods should themselves aim to keep disturbance to a minimum.

7. Clearing Methods

- » Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- » The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website

8. Identification of Alien Species

The National Environmental Biodiversity Management Act lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- » Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- » Category 2 - These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a landuser must obtain a water use licence as these plants consume large quantities of water.

- » Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species: *Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.*

9. Use of Herbicides for Alien Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which resprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- » The use of herbicides should be restricted for the control of alien species that cannot easily be controlled manually and should be applied according to the relevant instructions and by appropriately trained personnel.
- » Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- » All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- » Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- » To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- » Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- » The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed: *Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.*

APPENDIX F:
OPEN SPACE MANAGEMENT PLAN

OPEN SPACE MANAGEMENT PLAN

The following elements are considered part of the Open Space Management Plan. The principles contained within the Alien Invasive Management Plan should also be considered to form part of the Open Space Management Plan.

Access Control:

- » Access to the facility should be strictly controlled.
- » All visitors and contractors should be required to sign-in.
- » Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

Prohibited Activities:

The following activities should not be permitted by anyone except the landowner or his representatives:

- » No fires within the site.
- » No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- » No driving off of demarcated roads.
- » No interfering with livestock.

Fire Risk Management:

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- » Lightning strikes
- » Personnel within the facility
- » Infrastructure such as transmission lines

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire.

Firebreaks

Extensive firebreaks are not recommended as a fire-risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high-risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that

firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substation, a strip of vegetation 5-10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However if alien species colonise these areas, more regular clearing should be implemented.

**APPENDIX G:
REVEGETATION AND REHABILITATION
PLAN**

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the Karreebosch wind facility revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed Karreebosch Wind Farm are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation at the site can be summarized as follows:

- » Achieve long-term stabilisation of all disturbed areas to minimise ongoing erosion;
- » Re-vegetate all disturbed areas with suitable plant species;
- » Minimise visual impact of disturbed areas; and
- » Ensure that disturbed areas are safe for future uses.

It is also important to recognise that the rehabilitation plan and the erosion control plan should function hand in hand as the two factors are inextricably linked.

2. ECOSYSTEM CONTEXT

The site occurs within a semi-arid environment and a fundamentally different approach to rehabilitation efforts in such areas is required as compared to traditional rehabilitation approaches within more mesic areas. In addition, the site is within an extensive natural ecosystem of high biodiversity value and the use of any rehabilitation techniques which rely on agricultural techniques such as the application of fertilizer and the planting of annual grasses or other alien species are not appropriate. The major implication of the semi-arid nature of the site is that active rehabilitation outside of the wet season may lead to very poor results on account of dry conditions and low rainfall which is likely to characterize the dry season.

3. IDENTIFICATION OF TARGET AREAS

The construction activities required for the development will result in a lot of disturbance at the site. Rehabilitation is costly and time-consuming and therefore priority areas where rehabilitation should be focused must be identified. Priority areas include areas vulnerable to erosion such as on steep slopes as well as areas near to important ecosystems such as areas near to drainage lines.

4. TOPSOIL MANAGEMENT

Effective topsoil management is a critical element of rehabilitation, particularly in arid and semi-arid areas where soil properties are a fundamental determinant of vegetation composition and abundance. Although large parts of the site are devoid of topsoil, the

lower-lying areas contain significant topsoil that should be saved wherever possible. The topsoil should be used to cover cleared and disturbed areas once construction activity has ceased.

- » Topsoil is the top-most layer (0-25cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem;
- » Topsoil should be retained on site in order to be used for site rehabilitation. The correct handling of the topsoil is a key element to rehabilitation success. Firstly it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil;
- » Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods;
- » If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer the topsoil is stored, the more seeds, micro-organisms and soil biota are killed;
- » Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil;
- » If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.
- » Reduced activity at the site after large rainfall events when the soils are wet is encouraged. No driving off of hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.
- » Any topsoil, waste rock or other material dumps should be protected from erosion with silt traps and other suitable prevention measures.
- » Construction of gabions and other stabilization features on steep slopes to prevent erosion should occur.

5. GENERAL PRINCIPLES FOR REHABILITATION

5.1. Mulching

Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes.

- » During site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species;
- » Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- » No harvesting of vegetation may be done outside the area to be disturbed by construction activities; and
- » Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.

5.2 Seeding

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

- » Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien / invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- » Seed may be harvested by hand and if necessary dried or treated appropriately;
- » Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs must be kept apart from individually harvested seed;
- » No seed of alien or foreign species should be used or brought onto the site.

5.3 Transplants

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly.

- » Plants for transplant should only be removed from areas that are going to be cleared;
- » Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant;
- » Transplants should be nearby and should not be transported around the site to distant areas; and
- » Transplants must remain within the site and may not be transported off the site. Therefore, it is recommended that before construction commences individuals of listed species within the development footprint should be marked and translocated to similar habitat outside the development footprint under the supervision of an ecologist or someone with experience in plant translocation. Permits from the relevant provincial authorities will be required to relocate listed plant species.

5.4 Use of soil savers

On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.

- » In areas where soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface; and
- » Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination.

5.6. General

- » Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible;
- » Once revegetated, areas should be protected to prevent trampling and erosion;
- » No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated;
- » Where rehabilitation sites are located within actively grazed areas, they should be fenced;
- » Fencing should be removed once a sound vegetative cover has been achieved; and

- » Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

6. MONITORING REQUIREMENTS

As rehabilitation success, particularly in arid areas is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- » Re-vegetated areas should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year.
- » Re-vegetated areas showing inadequate surface coverage (less than 30% within 12 months after re-vegetation) should be prepared and re-vegetated.
- » Where transplants have been used the survival rate of the different species used should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year. The results should be used to inform the choice of species for transplant and other factors which may influence survival.

7. RIDGELINE SENSITIVITY

The priority high-elevation sections of the ridges have been identified in the Ecological Assessment report. Three different ridge sections have been identified as potential priority areas but it is the larger central ridge that is considered the most important. The extent of the demarcated area on the central ridge is approximately 3000 ha and the protection of this area from grazing would significantly improve the quality of the remaining habitat and is deemed to be the most suitable mitigation measure to address the likely impacts of the development on the ridgeline habitats.

As this requires the co-operation of the landowners, it may not be possible to secure the entire area and a minimum of 2000 ha is identified as a minimum area required to counter or 'offset' the impact of the development. As these areas are currently within much larger paddocks, it may be necessary to fence some of these areas off in order to retain the use of the lower-lying areas for livestock grazing. As it would not be possible to fence off the areas as demarcated, the actual area set aside would need to be larger than required as it would include areas outside of the demarcated area.

The rationale for setting these areas aside from grazing is that the ridgelines are currently grazed by livestock and this has a visible impact on the vegetation condition of these areas and also introduces alien species in sheep wool and dung. Setting these areas aside from grazing would release the vegetation from grazing pressure and improve the quality of the habitat for fauna as well as grazing-sensitive plant species. Although grazing is an important disturbance that serves to maintain the diversity of plant communities, there are more than enough indigenous grazing animals in these areas to perform this function and the overall impact of livestock is negative.

With the implementation of the above grazing protection mitigation area, the impacts on listed flora and the cumulative impact on the ridgeline habitat would be reduced to an acceptable level. The implementation of such an area should be included as part of the required mitigation measures to be implemented by the wind farm development as there do not appear to be any other viable mitigation mechanisms available.

**APPENDIX H:
TRAFFIC AND TRANSPORTATION
MANAGEMENT PLAN**

TRAFFIC MANAGEMENT PLAN

1. INTRODUCTION

During the construction of the Karreebosch Wind Farm, turbine components will be delivered to site using road transport. The purpose of a Traffic Management Plan (TMP) is to minimise the potential traffic related incidences on the project site, as well as impact of project related traffic on other road users and people living along transport routes.

The Karreebosch Wind Farm is still in the early planning phase and contractors and the final route from port to sites has not been confirmed. A Transport Study, covering this aspect will be undertaken at least three months prior to construction and the findings and any additional mitigation measures should be incorporated into this TMP.

2. LEGAL REQUIREMENTS

Due to the size of the turbine components, the vehicles used to deliver components will be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). A permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority. The vehicle must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads, issued by the Department of Transport, 2009.

3. VEHICLE MOVEMENTS

Approximately nine truck loads would be required to deliver the required components for one turbine, as indicated below:

- » One for the nacelle;
- » Four for the turbine tower;
- » One for the rotor and hub; and
- » Three for the blades.

Up to 528 vehicle movements would be required to deliver the wind turbine components for the 66 proposed turbines over the construction period. The construction will, however, be phased and the above mentioned vehicle movements will be spread out through during of the construction period of over 24 months. Other heavy vehicle deliveries would be required to transport cables, machinery and construction material for the substation. The construction phase of the project would take over 24 months and during this time increases in traffic levels would be intermittent and temporary in nature.

During the construction phase, workers would also have to travel to and from the site on a daily basis. .

Once all phases are operational, there would be an operations team comprising of up to 122 full time personnel. These employees would have to commute to and from the site on a daily basis. Maintenance staff would visit the site several times a month requiring one or two vehicles. In addition, infrequent deliveries of replacement parts may be made during the lifespan of the Wind Farm. Potential traffic impacts associated with the operation of the facility would be largely limited to the site and the local access road.

4. PORT TO SITE DELIVERY ROUTE

Port of Saldanha Bay in the Western Cape will be the port of entry. The most likely route is outlined below and can be seen in Figure 1.

Turbine components will arrive by sea at the Port of Saldanha and be transported by road to the R27 heading North. The R27 connects to the R45 and then to the N7. From the N7 the route will connect to the R311 and then the R46 at Riebeeck Kasteel. The vehicles will then stay on the R46/R45/R44 (Ceres Road) past Ceres via the Ceres Pass and connect to N1 south west of Touws River. The route would then connect onto the R354 and the site will be accessed via the R354.

It is likely that there will be four or more site access roads from the R354, including one accessing the south of the site from the R354 and one accessing the north of the site from the R354. There may also be a site access road accessing the centre of the site from the R354. Site access roads will be up to 12 m wide with drainage trenches adjacent to the road.

The above route has been investigated by several transport companies and is currently being discussed amongst several government departments and the industry to become the designated and cleared route for wind farm components for all projects planned in the Central Karoo area

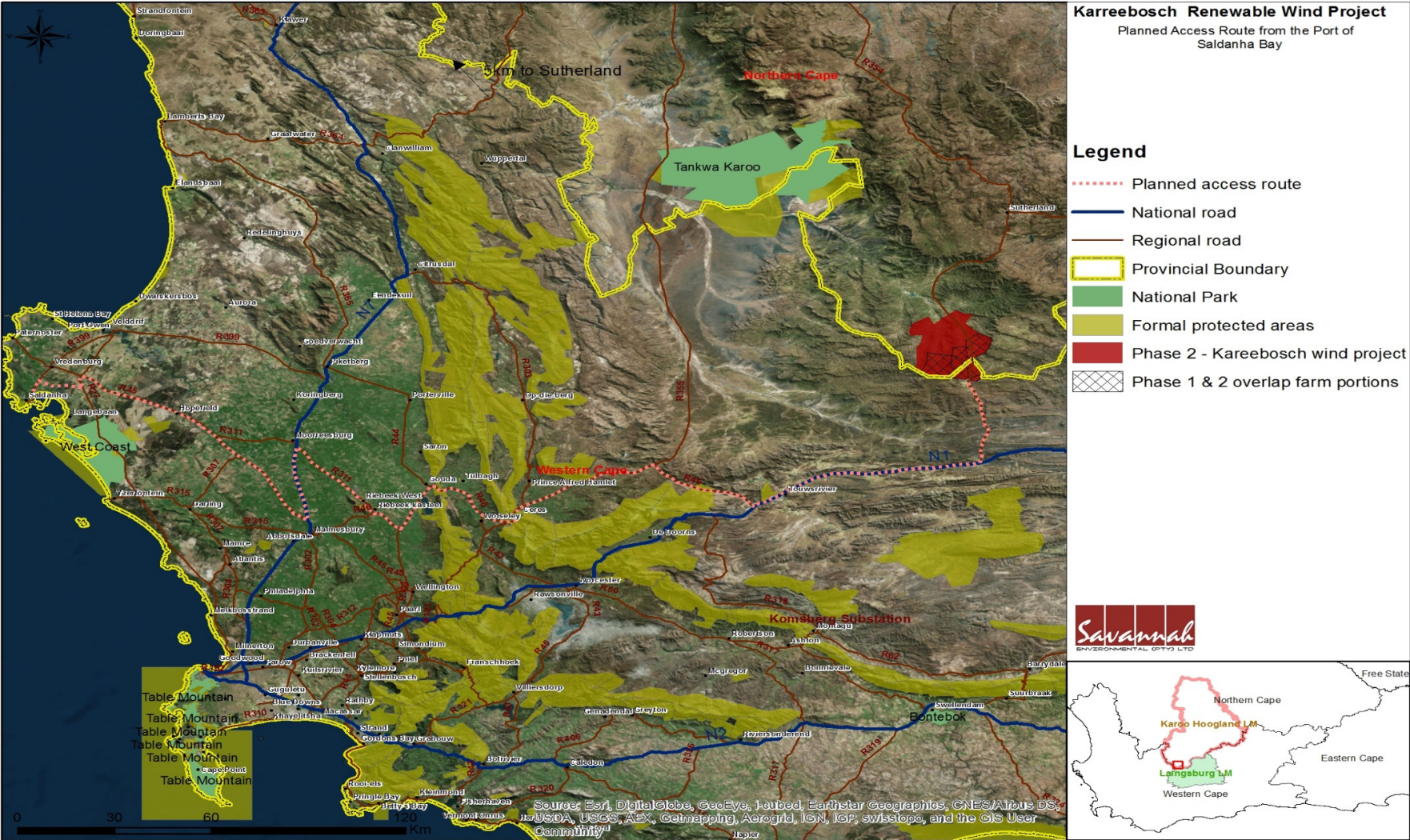


Figure 1: Traffic route from Port to site

APPENDIX I:
BIOLOGICAL MONITORING PLAN

BIOLOGICAL MONITORING

1. Introduction

Specific biological monitoring requirements that are required to be undertaken through the various phases of the Karreebosch Wind Farm have been identified through specialist studies and are described in this section. The monitoring programs described below were developed by the specialists as part of the EIA specialist studies. Biological monitoring is required during the pre-construction, construction and operational phases of the project, particularly for birds and bats.

Table 1 provides a summary of what monitoring is required at the various phases of the development. KWF is responsible for ensuring that all monitoring measures described in this section are undertaken by appointing the relevant specialists where necessary. The pre-construction bird and bat monitoring for the Karreebosch wind farm has been completed and therefore no protocol is included in this section.

Table 1: Monitoring Requirements

	Ecology	Bats	Birds
Pre-construction		X	X
Construction	X		
Operational	X	X	X

2. Pre-construction Phase

Pre-construction monitoring is an essential requirement prior to construction in order to validate within reason that final turbine placement and arrangement, as well as mitigation and management measures as included in this EMPr, will minimize potential impacts on birds, bats and other terrestrial ecological components and also in order to gain consequential knowledge for future wind farm projects to be developed in the country. The pre-construction bird and bat monitoring for the Karreebosch wind farm has been completed and therefore no protocol is included in this section.

2.1. Ecological Monitoring (excluding Bats and Birds)

2.1.1. Monitoring Impacts on Rare or Endangered Plant Species

There are a number of listed plant species which may occur at the site. If required and determined by the ecologist, monitoring should occur pre-construction to identify listed species within areas that will be impacted by the development. The following recommendations are made in this regard:

- » preconstruction surveys of the turbine sites is recommended in order to avoid impacts on listed species and rare edaphic habitats and should be marked so that they can be relocated to an adjacent similar environment at the appropriate time.
- » Number and identities of all species translocated should be recorded.
- » Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

2.2. Construction Phase

Mammals, reptiles and amphibians are most likely to be exposed to impacts during the construction phase of the Karreebosch Wind Farm primarily through loss of habitat and impacts associated with construction vehicles and workforce. This section describes the biological monitoring measures that should be undertaken during the construction phase.

2.2.1. Ecological Monitoring (excluding Bats and Birds)

In general, during the construction phase, monitoring should be used to ensure that the development takes place within the guidelines provided by this document to ensure that construction minimises or avoids impacts on adjacent natural vegetation, fauna and ecosystems.

Monitoring Loss of Habitat and Habitat Fragmentation

Habitat loss and fragmentation is primarily a concern during the construction phase since this is when the majority of disturbance will take place. Specific areas that should be monitored include:

- » Any deviations from the final construction plan, including the location, extent and nature of vegetation impact and transformation.
- » The location and extent of temporary lay-down areas, these should be included in the sweeps for alien species.
- » Any inadvertent or otherwise unintended destruction of natural vegetation and the remediation steps taken to encourage the recovery of the impacted areas.
- » Monitoring frequency would need to be high, daily or weekly during the construction phase. During the operational phase monitoring could be conducted on an ad-hoc basis coincide with maintenance activities that may impact natural vegetation, such as servicing of the turbines.
- » During the operational phase, it is recommended that a fire monitoring system is set in place to record the date, extent and source of all fires at the site. Fire is a key ecological driver in fynbos vegetation and the extent to which the development impacts the fire regime at the site should be established so as to better inform long-term fire management at the site.

It is important to note that although Renosterveld is usually a fire-prone ecosystem, there was little evidence of regular fires at the site. Discussions with the local farmers also confirmed that although fires do occasionally occur, they are not a regular feature and are not used by farmers as a veld management tool. Within arid Renosterveld types, the significance of fire is reduced and it does not appear that fire is an important ecosystem driver at the site that may be disrupted by the development. Fire scars at the site indicated that occasional natural fires may be caused by lightning ground-strikes, but their subsequent spread appears to be limited to areas of dense vegetation on south-facing slopes or other moist environment where sufficient biomass can accumulate.

Monitoring Impacts on Sensitive Environments

The sensitive environments at the site require specific attention to avoid and mitigate negative impacts to these areas. Sensitive areas include rare edaphic environments as well as ridgelines, drainage lines, seeps and wetlands. These areas will be particularly vulnerable to negative impact during the construction phase when the major infrastructure associated with the development is laid down. The ridges are the most important habitat at the site since the turbines will be located on the ridges and the majority of the footprint would be along the ridges. In terms of the current study, the ridges can be divided into two basic types, the two eastern ridges and the two western ridges. In general the eastern ridges can be considered more sensitive than the western ridges as the eastern ridges are wetter and contain a significantly higher abundance of species of conservation concern as well as sensitive plant communities. There are however some very high elevation sections along the most western ridge which are considered sensitive.

Three different ridge sections have been identified as potential priority areas but it is the larger central ridge that is considered the most important. The extent of the demarcated area on the central ridge is approximately 3000 ha and the protection of this area from grazing would significantly improve the quality of the remaining habitat and is deemed to be the most suitable mitigation measure to address the likely impacts of the development on the ridgeline habitats. As this requires the co-operation of the landowners, it may not be possible to secure the entire area and a minimum of 1300 ha is identified as a minimum area required to counter or 'offset' the impact of the development. As these areas are currently within much larger paddocks, it may be necessary to fence some of these areas off in order to retain the use of the lower-lying areas for livestock grazing. As it would not be possible to fence off the areas as demarcated, the actual area set aside would need to be larger than required as it would include areas outside of the demarcated area.

The rationale for setting these areas aside from grazing is that the ridgelines are currently grazed by livestock and this has a visible impact on the vegetation condition of these areas and also introduces alien species in sheep wool and dung. Setting these areas aside from grazing would release the vegetation from grazing pressure and improve the quality of the habitat for fauna as well as grazing-sensitive plant species. Although grazing is an important disturbance that serves to maintain the diversity of plant communities, there are more than enough indigenous grazing animals in these areas to perform this function and the overall impact of livestock is negative.

With the implementation of the above grazing protection mitigation area, the impacts on listed flora and the cumulative impact on the ridgeline habitat would be reduced to an acceptable level. The implementation of such an area should be included as part of the required mitigation measures to be implemented by the wind farm development as there do not appear to be any other viable mitigation mechanisms available.

During the construction phase, monitoring should largely be directed towards enforcement to ensure that these areas are not negatively impacted. As such, monitoring of these aspects should be on a continuous basis. During the operational phase there are not likely to be many activities which pose a direct risk to these areas. Specific recommendations include:

- » Before roads are constructed, their proposed routes should be inspected on foot and all wetlands and riparian areas mapped and recorded on a GPS. Where planned roads traverse wetlands, these should be rerouted so as to avoid the wetlands. The services of an ecologist trained in the field may be required to accurately identify and delineate the wetlands.
- » Where roads traverse rivers and drainage lines, the sites should be monitored to ensure that the presence of the road is not resulting in erosion or the deposition of large amounts of silt.
- » The state of potentially vulnerable wetlands near to roads should be recorded, preferably during the late wet season. A repeat photography method is suggested as a simple yet cost effective manner for monitoring wetland state. It is important to note that near and close-up pictures would be required to adequately assess changes in wetland state.
- » The implementation of a livestock grazing free area within the high ridges should be implemented to reduce the long-term impact of the development in listed and protected plant species.
- » Ensure that lay down areas, construction camps and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate,
- » All vehicles to remain on demarcated roads and no driving in the veld should be allowed.

- » No-Go areas should be demarcated and labelled in areas in proximity to the development footprint, such as drainage areas or sensitive habitats.

Monitoring Impacts on Rare or Endangered Plant Species

There are a number of listed plant species which may occur at the site. Monitoring should occur pre-construction to identify listed species within areas that will be impacted by the development. The following recommendations are made in this regard:

- » Number and identities of all species translocated should be recorded.
- » Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

Monitoring Direct Faunal Impacts

Particularly during the construction phase but also during the operational phase, direct faunal impacts are a concern of the development. Monitoring during the construction phase should be used to ensure that human-animal interactions are kept to a minimum and during the operational phase to assess the extent to which animal populations are vulnerable to or recover from the negative effects of the development.

- » The traffic on the access and service roads poses a significant risk to many animals, particularly during the construction phase when traffic volumes on the roads are likely to be heavy. Any fauna accidentally killed during construction or maintenance activities should be reported and a log of such mortalities maintained. Where possible the species killed should be identified and recorded as well. Monitoring should be on an ad-hoc basis, as incidents occur.
- » The activities of construction staff should be monitored to ensure that undesirable activities such as hunting, illegal collecting of plants, seeds or any other biological material does not occur, and that fires outside of the designated and demarcated areas do not occur. Any incidents or transgressions relating to these aspects should be logged, as well as the remedial steps taken to rectify the situation.
- » As part of mitigation, monitoring studies on potentially vulnerable species or groups of species such as tortoises, by students or universities could be encouraged and funded. There is a general paucity of knowledge on the ecological impacts of renewable energy facilities in South Africa and better knowledge will enable improved understanding of the nature of impacts as well as improve mitigation strategies.
- » If any parts of the facility need to be fenced off then no electrical fencing should be placed within 40cm of the ground to avoid impacts on tortoises.
- » All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.

- » Ensure that the cabling and electrical infrastructure at the site is buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals such as porcupines and springhare, which may seek such material out.
- » Any dangerous fauna (snakes, scorpions etc) that are encountered during construction should not be handled or molested by the construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety.
- » Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have places where the loose material has been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape.

2.3. Operational Phase

Birds and bats are likely to be impacted during the operational phase of the Karreebosch Wind Farm, primarily through collisions with the wind turbines or electrocutions with existing power lines. It is important to note that pre-construction monitoring has been completed. This section describes the monitoring measures to be undertaken during the operational phase of the Karreebosch Wind Farm. The monitoring requirements presented here may be modified based on the results of post-construction monitoring and should therefore be regarded as provisional.

2.3.1. Bat Monitoring

The degree and type of post-construction monitoring is dependent on pre-construction monitoring programme results.

Identifying spatial patterns of bat fatalities among turbines within a facility is important for developing mitigation strategies to reduce or eliminate fatalities. For example, if fatalities are concentrated at specific turbines, then turbine specific mitigation strategies, such as curtailment, removal, or relocating the turbine, may reduce bat fatalities; however, if fatalities are broadly distributed, then facility-wide mitigation strategies must be considered. An outline of preliminary methodology to be employed during operation monitoring for bats has been included Appendix F of the EIA report, Savannah 2015). This is in line with the latest version of the **South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments** document.

2.3.2. Bird Monitoring

The primary aims of long term bird monitoring during the operational phase of the wind farm are similar to those of the pre-construction monitoring discussed above. In addition, monitoring during the operational phase seeks to register and as far as possible document the circumstances surrounding all avian collisions with the turbines for at least a full calendar year after the facility becomes operational.

The operational monitoring protocol outlined below was developed by an avifauna specialist (Dr. Andrew Jenkins), however, the final operational monitoring methodology for the Karreebosch Wind Farm may be further refined by the specialist appointed to undertake the monitoring, using the latest guidelines (i.e. the South African Birds and Wind Energy Specialist Group BAWESG guidelines) and best practice.

Avian densities

A set of at least 10 walk-transect routes, each of at least 1000 m in length, should be established in areas representative of all the avian habitats present within a 10 km radius of the centre of the Karreebosch site. Each of these should be walked at least 6-12 months after the wind farm is commissioned. The transects should be walked after 06h00 and before 09h00, and the species, number and perpendicular distance from the transect line of all birds seen should be recorded for subsequent analysis and comparison.

In addition:

- » The cliff-lines within or close to the development area should be surveyed for cliff-nesting raptors at least every six months using documented protocols (Malan 2009).
- » Known large eagle nest sites should also be checked twice annually for signs of occupation and breeding activity.
- » All sightings of key species (e.g. Verreaux's Eagle, Namaqua Sandgrouse, Martial Eagles, Black Harriers, Jackal Buzzard, Rock Kestrel and White Necked Raven) as stated in the pre-construction bird monitoring programme report should be carefully plotted and documented.

Bird activity monitoring

Monitoring of bird activity in the vicinity of the Wind Farm should be done over a 2-3 day period at least once per quarter for a full calendar year starting at least six months after the Wind Farm is commissioned. Each monitoring day should involve:

- » Half-day counts of all priority species flying over or past the wind energy facility impact area; and
- » Opportunistic surveys of cranes (and bustards), raptors and any other important species seen when travelling around the Karreebosch site.

Passage Rates of Priority Bird Species

Counts of bird traffic over and around the operational wind farm should be conducted from suitable vantage points (and a number of these should be selected and used to provide coverage of avian flights in relation to all areas of the wind farm), and extend alternately from an hour before dawn to midday, or from midday to an hour after dusk, so that the equivalent of four full days of counts is completed each count period. This should provide an adequate (if minimal) sample of bird movements around the facility in relation to a representative cross-section of conditions and times of day, for all seasons of the year. Details regarding specific measures to be undertaken post construction are identical to those listed for monitoring of passage rates of priority bird species during the pre-construction phase .

Avian collisions

Collision monitoring should have two components: (i) experimental assessment of search efficiency and scavenging rates of bird carcasses on the site, and (ii) regular searches of the vicinity of the wind farm for collision casualties.

Assessing search efficiency and scavenging rates

The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed (Morrison 2002). To do this, a sample of suitable bird carcasses (of similar size and colour to the priority species – e.g. Egyptian Goose *Alopochen aegyptiacus*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the surveyor, sometime before the site is surveyed (e.g. Shaw *et al.* 2010a & b). This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two months of the monitoring period, with the total number of carcasses not less than 20. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method.

Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial two-month period, to determine the rates at which carcasses are scavenged from the area, or decay to the point that they are no longer obvious to the surveyor. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximize survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate (Osborn *et al.* 2000, Morrison 2002). Scavenger numbers and activity in the area may vary seasonally so, ideally, scavenge and decomposition rates should be measured twice during the monitoring year, once in winter and once in summer.

Collision victim surveys

The area within a radius of at least 50 m of the outer arc of the blades of each of the turbines at the facility should be checked regularly for bird casualties (Anderson *et al.*

1999, Morrison 2002). The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted in the initial stages of the monitoring period (see above), but they should be done at least weekly for the first two months of the study, and surveys should commence as soon as possible after construction is completed. The area around each turbine, or a larger area encompassing the entire wind facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the precise location (a GPS reading), date and time at which the evidence was found, and the site of the find should be photographed with all the evidence *in situ*. All physical evidence should then be collected, bagged and carefully labelled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority (in this case CapeNature, failing this inform the monitoring project specialist) should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above).

2.3.3. Ecological Monitoring (Excluding Birds and Bats)

During the operational phase, monitoring should be focused on ensuring that there are no residual impacts such as soil erosion and alien plant invasion resulting from the construction phase, and on reducing the day to day impact of the Karreebosch Wind Farm.

Operational monitoring can be undertaken by a suitably qualified ecologist or environmental control officer on a monthly basis. After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks.

Specific aspects to be monitored during operation would include:

Disturbance of sensitive habitat during maintenance:

Habitat damage caused by movement of vehicles and equipment during turbine or infrastructure maintenance activities.

Alien Plant Invasion

The large amount of disturbance at the site is likely to render it highly vulnerable to alien plant invasion, particularly in the first few years post-construction. The roads and disturbed areas around the turbines are likely to be the major invasion foci. Monitoring for aliens should include the following:

- » In a similar manner to erosion, an alien monitoring system should be set up which allows for the occurrence, persistence and treatment of alien plants to be monitored in a manner which allows the data to be interrogated in a GIS.
- » Monitoring for alien plants could be done simultaneously with erosion monitoring and at a similar interval.
- » The system should record the species present, their location, the control measures used and their success rate.

APPENDIX J:

MAP

