
WIND ENERGY FACILITY & ASSOCIATED INFRASTRUCTURE, WESTERN CAPE PROVINCE

CONSTRUCTION & OPERATION ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE WIND ENERGY FACILITY PROJECT:

PRINCIPLES OF ENVIRONMENTAL MANAGEMENT SUPPORTED BY SITE SPECIFIC GUIDELINES

Submitted as part of the Final EIA Report

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

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.

Archaeological material: Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Calcrete: A soft sandy calcium carbonate rock related to limestone which often forms in arid areas.

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

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

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

Dorbank horizon: A cemented crusty hard surface from an ancient landscape that underlies Aeolian sands in many areas on the west coast.

Early Stone Age: A very early period of human development dating between 300 000 and 2.6 million years ago.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals

have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

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

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

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

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

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

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

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

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

HWC (Heritage Western Cape): The provincial compliance agency responsible for the conservation of heritage.

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

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

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

Late Stone Age (LSA): In South Africa this time period represents fully modern people who were the ancestors of southern African Khoekhoen and San groups (40 000 – 300 years ago).

Middle Stone Age (MSA): An early period in human history characterised by the development of early human forms into modern humans capable of abstract thought process and cognition 300 000 – 40 000 years ago.

Midden: A pile of debris or dump (shellfish, stone artefacts and bone fragments) left by people after they have occupied a place.

Natural properties of an ecosystem (*sensu* Convention on Wetlands): Defined in Handbook 1 as the "...physical, biological or chemical components, such as soil, water, plants, animals and nutrients, and the interactions between them". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see <http://www.ramsar.org/>)

Palaeontological: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Pleistocene: A geological time period (of 3 million – 20 000 years ago).

Pliocene: A geological time period (of 5 million – 3 million years ago).

Ramsar Convention on Wetlands: "The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". As of March 2004, 138 nations have joined the Convention as Contracting Parties, and more than 1300 wetlands around the world, covering almost 120 million hectares, have been designated for inclusion in the Ramsar List of Wetlands of International Importance."

(Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (refer <http://www.ramsar.org/>). South Africa is a Contracting Party to the Convention.

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

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

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

Sustainable Utilisation (*sensu* Convention on Wetlands): Defined in Handbook 1 as the "human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (refer <http://www.ramsar.org/>).

Wise Use (*sensu* Convention on Wetlands): Defined in Handbook 1 (citing the third meeting of the Conference of Contracting Parties (Regina, Canada, 27 May to 5 June 1987) as "the wise use of wetlands is their sustainable utilisation for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem". (Ramsar Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see <http://www.ramsar.org/>)

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PURPOSE & OBJECTIVES OF THE EMP

CHAPTER 1

An Environmental Management Plan (EMP) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”¹. The objective of this Environmental Management Plan is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals.

The EMP provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site remediation (soil stabilisation, revegetation) and operation. The purpose of the EMP is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management for the wind energy facility project), 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 (refer Appendices A to H) and an interactive GIS-interface for assisted use of the EMP by the project implementer as well as compliance monitors).

The EMP has the following objectives:

- » To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the Wind Energy Facility.
- » To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.

¹ Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

- » To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » To propose mechanisms for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » To facilitate appropriate and proactive response to unforeseen events or changes in project implementation that were not considered in the EIA process.

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

It should be noted that since this EMP is part of the EIA process undertaken for the proposed Wind Energy Facility project, it is important that this guideline document be read in conjunction with the Scoping Report (September 2007) and EIA Report (February 2008). This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental process. This EMP for construction and operation activities has been compiled in accordance with Section 34 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. This EMP will be further supported by requirements to be detailed by the project safety, health, environment and quality (SHEQ) officer, as well as method statements to be detailed by the contractors.

PROJECT DETAILS

CHAPTER 2

Eskom Holdings Limited is proposing to establish a commercial wind energy facility on a site on the West Coast (north of the Olifants River) in the Western Cape Province. This development is proposed to comprise a cluster of up to 100 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed over an area of approximately 16 km² in extent.

The construction and commissioning of the facility is proposed to be implemented in two phases, with the first commissioned phase of the project planned to comprise approximately 50 turbines (that is, approximately fifty 2 MW to 2,5 MW industry standard turbines which would generate in the order of 100 MW). The second phase would comprise the remaining fifty turbines (the total facility not exceeding 100 turbines). The generating capacity of the facility will be dictated by the choice of turbine (a current industry standard of 2 MW turbines has been assumed at this time). The infrastructure associated with the total wind energy facility would, therefore, include:

- » Up to 100 **wind turbine units** (approximately 80 m high steel tower and nacelle, with a hub height of 80 m; 90m diameter rotor (consisting of 3x45 m blades)).
- » A concrete **foundation** (of 15 m x 15 m x 2 m) to support each turbine tower.
- » Underground electrical cabling between turbines and the substation.
- » A **substation** (with a footprint of 80 m X 80 m) in an appropriate position to receive generated power via underground distribution cabling from each wind turbine.
- » Overhead **power line** (132 kV distribution lines) from the wind farm substation feeding into the electricity network/grid at the Juno transmission substation (near Vredendal).
- » An access/**haul road** to the site from the main R363 road at Koekenaap
- » Internal **access roads** providing access to each wind turbine site (with a permanent travel surface of approximately 6 m in width)
- » A **visitors centre** at the facility entrance (with a footprint of ~1 000 m²).

The Wind Energy Facility will operate as a peaking power generation station (with a nominal generating capacity in the order 200 MW utilising current best available technologies). The facility will be fuelled by wind. No other fuels will be used as a generating fuel during the operation phase.

The design and integration of the system components will be conducive to a safe working system, under all climatic, operating and fault conditions. The following design conditions are relevant to the wind energy generating turbines proposed for the facility:

- » A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation.

- » The turbines can start generating at wind speeds of approximately 10 km/hr (~3 m/s).
- » Nominal wind speeds required for full power operation vary between ~45 km/hr and 60 km/hr (12.5 m/s and 17 m/s).
- » At very high wind speeds (typically over 90 km/hr (25 m/s)) the wind turbine will cease power generation and shut down. Having a cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.
- » Once operating, the facility can be monitored and controlled remotely, with a mobile team for maintenance, when required.

The wind energy facility will connect to the National electricity grid via a 132 kV power line from the facility to Juno Substation, situated outside Vredendal.

The main activities/components associated with the wind energy facility project are detailed in Table 1 and comprise the following:

Table 1: Summary of activities that form part of the proposed wind energy facility development

Main Activity/Project Component	Components of Activity	Details
Construction of Wind Energy Facility		
Conduct surveys	<ul style="list-style-type: none"> » Geotechnical survey by geotechnical engineer: <ul style="list-style-type: none"> * Non-intrusive ground testing. Drilling rig 4m high * Drilling 30m to extract samples * Test pits » Site survey and confirmation of the turbine micro-siting footprint (this micro-siting exercise will be required to be undertaken in conjunction with qualified heritage and vegetation specialists) » Survey of substation site (to be undertaken in conjunction with qualified heritage and vegetation specialists) » Survey of power line servitude to determine tower locations (to be undertaken in conjunction with qualified heritage, vegetation and avifauna specialists) 	<ul style="list-style-type: none"> » All surveys to be undertaken prior to initiating construction
Establishment of access roads to the site	<ul style="list-style-type: none"> » Upgrade access/haul road to the site (Skaapvlei road DR2225) » Establish internal access roads: <ul style="list-style-type: none"> * 6m wide permanent roadway within the site between the turbines for use during construction and operation phase * Temporary track (adjacent to and 	<ul style="list-style-type: none"> » Access roads will be constructed 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 (including the road to Skaapvlei) will be utilised, and upgraded where required. » Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation.

Main Activity/Project Component	Components of Activity	Details
	<p>utilising part of the permanent road) of between 12m and 14m in width for use by the crawler crane during construction phase only.</p>	<ul style="list-style-type: none"> » The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as heritage and vegetation specialists surveys). » To accommodate the large crawler crane required for turbine assembly, a track of 12m to 14m in width is required to be established on the site to accommodate the passage of the fully rigged crawler crane.
Undertake site preparation	<ul style="list-style-type: none"> » Site establishment of offices with ablutions and stores, contractors yards: <ul style="list-style-type: none"> * IT receiver and repeater * Laydown areas for steel reinforcement cages * Laydown areas for formwork » Establishment of internal access roads (permanent and temporary roads) » Clearance of vegetation at the footprint of each turbine (permanent) » Excavations for foundations 	<ul style="list-style-type: none"> » These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site. » Some of the activities associated with offices will be placed on a portion of the 40x40 laydown area. This area can be rehabilitated after construction.
Establishment of lay down areas on site	<ul style="list-style-type: none"> » Lay down areas (temporary footprint 40m x 40m) at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment. » Temporary lay down area for crane assembly (max 20m x 150m wide). 	<ul style="list-style-type: none"> » The lay down area will need to accommodate the cranes required in tower/turbine assembly. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site. » A large lay down area (approximately 20 m wide x 150 m long) will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides. Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.

Main Activity/Project Component	Components of Activity	Details
Construct wind turbine foundations	<ul style="list-style-type: none"> » Concrete foundations of approximately 15 m x 15 m x 2 m depth at each turbine location 	<ul style="list-style-type: none"> » Foundation holes will be mechanically excavated to a depth of approximately 2 m. Shoring and safety barriers will be erected. » Earthmatts and cable sleeves will be installed. » Reinforced steel cages will be erected. » Formwork erected and then dismantled after concrete pour. » Concrete will be batched at an appropriate location off-site and brought to site when required via ready-mix cement trucks (approximately 20 trucks per foundation). » The reinforced concrete foundation will be poured (continuous pour) and will support a mounting ring. » The foundation will then be left up to cure before the turbine erection. Formwork will be removed and the foundation will be backfilled and compacted. » If the geological conditions dictate, the use of alternative foundations will be considered (e.g. reinforced piles).
Transport of components and equipment to site	<ul style="list-style-type: none"> » Flatbed trucks will be used to transport all components to site: <ul style="list-style-type: none"> * Turbine units consist of a tower comprised of 4 segments of approximately 20 m in length, a nacelle weighing approximately 83 tons, and three rotor blades (each of approximately 45 m in length). * Components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to 	<ul style="list-style-type: none"> » The wind turbine, including tower, will be brought to site by the supplier in sections. » The individual components are defined as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the 45 m 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.

Main Activity/Project Component	Components of Activity	Details
	<p>erect the wind turbines.</p> <ul style="list-style-type: none"> * The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.). * The components required for the establishment of the substation (including transformers) * Components required for the establishment of the power line (including towers and cabling) * Ready-mix cement trucks for turbine, substation and visitors centre foundations 	<ul style="list-style-type: none"> » The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Erect turbines	<ul style="list-style-type: none"> » Large lifting crane for lifting of large, heavy components » A small crane for the assembly of the rotor » Wind turbine components: <ul style="list-style-type: none"> * tower of approximately 78m in height * nacelle with hub height at ~ 80m * rotor approximately 90m in diameter * temporary diesel generators and compressors for construction and commissioning purposes 	<ul style="list-style-type: none"> » The large lifting crane will lift the tower sections into place. » 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. It will then be lifted to the nacelle and bolted in place. » It will take approximately 2 days to erect the turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor. » Turbines will be sited up to 300m apart from each other, with rows being 650m apart. This is to minimise wake effects and wind turbulence. » The lifting cranes will be required to move between the turbine sites. The crawler crane is self-powered and can "crawl" between locations

Main Activity/Project Component	Components of Activity	Details
		<p>should the ground conditions allow. When assembled, the crawler crane has a track width of approximately 11m.</p>
Construct substation	<ul style="list-style-type: none"> » Gas Insulated Substation » Other substation components » Security fencing around high-voltage (HV) Yard 	<ul style="list-style-type: none"> » The substation will be constructed with a high-voltage (HV) yard footprint of up to 80m x 80m. » The substation would be constructed in the following simplified sequence: <ul style="list-style-type: none"> * Step 1: Survey of the site * Step 2: Site clearing and levelling and construction of access road to substation site * Step 3: Construction of terrace and foundations * Step 4: Assembly, erection and installation of equipment (including transformers) * Step 5: Connection of conductors to equipment * Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas. » The positioning of the substation has been informed by the micro-siting of the turbines
Establishment of ancillary infrastructure	<ul style="list-style-type: none"> » Visitors centre » Office/workshop structure 	<ul style="list-style-type: none"> » These structures would occupy a footprint of about 400 m² under roof. » Will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. » A lay down area for building materials and equipment associated with these buildings will also be required. » Permanent areas such as parking areas will also be associated with the visitors centre.
Connection of wind turbines to the on-site substation	<ul style="list-style-type: none"> » 33 kV underground electrical cabling connecting each turbine to the substation 	<ul style="list-style-type: none"> » The installation of these cables will require the excavation of trenches, approximately 1m in depth within which these cables can then be laid. » The underground cables would follow the internal access roads.

Main Activity/Project Component	Components of Activity	Details
Connect substation to power grid	<ul style="list-style-type: none"> » Double-circuit 132 kV power line connecting the substation to the electricity distribution network/grid at the Juno Transmission Substation (outside Vredendal). 	<ul style="list-style-type: none"> » A route for the power line will be assessed, surveyed and pegged prior to construction. » The power line servitude will follow other existing linear infrastructure (including roads and or other power lines) as closely as possible to consolidate linear infrastructure in the area, and to minimise the need for additional points of access. » The power line will be constructed utilising a monopole steel pole structure with stand-off insulators and will be approximately 24 m in height. » A servitude of approximately 32 m will be required for this power line.
Commissioning of the facility	<ul style="list-style-type: none"> » Commissioning of Phase 1 » Commissioning of Phase 2 	<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 and unit performance. » Physical adjustments may be needed such as changing the pitch of the blades. » The schedule for this activity will be subject to site and weather conditions.
Undertake site remediation	<ul style="list-style-type: none"> » Remove all construction equipment from the site » Rehabilitation of temporarily disturbed areas where practical and reasonable 	<ul style="list-style-type: none"> » On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation. » Due to the mobility of the sandy soils, and as rehabilitation and recovery of vegetation on the site will be slow, rehabilitation activities will (as far as possible) be carried out at each turbine location once construction of that particular turbine is completed.

Main Activity/Project Component	Components of Activity	Details
<i>Operation of the Wind Energy Facility</i>		
Operation	<ul style="list-style-type: none"> » Operation of turbines within the wind energy facility 	<ul style="list-style-type: none"> » Once operational, the wind energy facility will be monitored remotely. » It is estimated that the operational phase of the project will provide employment for approximately 6 skilled staff members (based off-site), who will be responsible for monitoring and maintenance when required. » No permanent staff will be required on site for any extended period of time. » Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.
Maintenance	<ul style="list-style-type: none"> » Oil and grease - turbines » Transformer oil - substation » Waste products 	<ul style="list-style-type: none"> » The wind turbine will be subject to periodic maintenance and inspection. » Periodic oil changes will be required. » Any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation. » The turbine infrastructure which will be utilised for the proposed wind energy facility on the West Coast is expected to have a lifespan of approximately 20 - 30 years (with maintenance).
<i>Decommissioning</i>		
Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes » Preparation of the site (e.g. lay down areas, construction platform) » Mobilisation of construction equipment 	<ul style="list-style-type: none"> » Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.
Disassemble and replace existing turbine	<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.

Figure 1 illustrates the site location and Figure 2 details the expected site layout and extent in relation to identified areas of potential environmental sensitivity. Management measures for these identified areas of potential sensitivity are detailed in Chapters 4 to 7 of this EMP.



Figure 1: Illustration of the site location

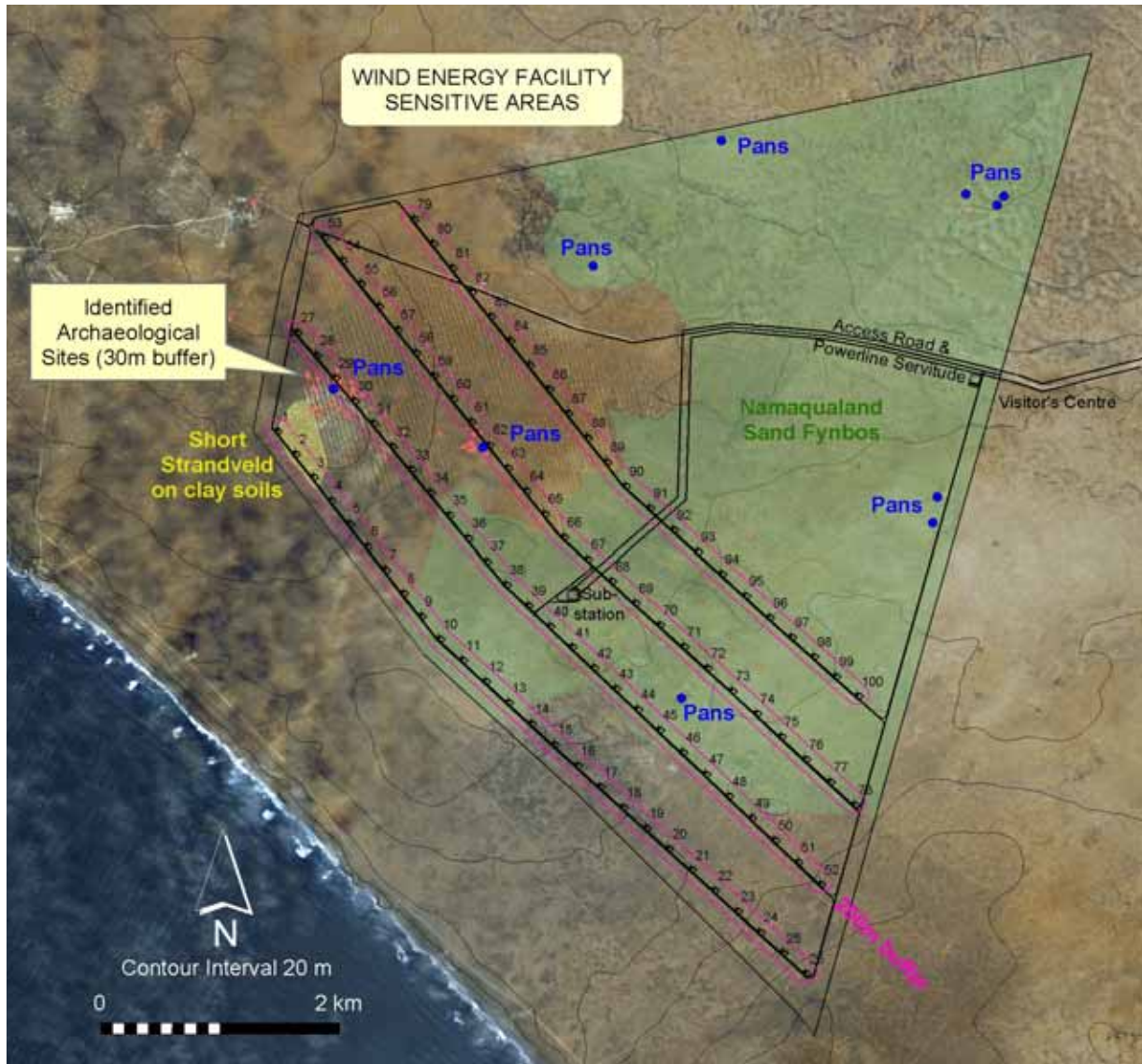


Figure 2: Detail of the expected site layout and extent in relation to identified areas of potential environmental sensitivity

The extent of the Namaqualand Sand Fynbos (Fynbos biome) vegetation type is illustrated in Figure 9.1 above. This vegetation type is listed as Least Threatened in the NSBA, with 98% remaining, and a conservation target of 29% (1% currently conserved). As at least one Red Data Book listed species was found in significant numbers in this area during the field survey, and as the habitat is regarded as more sensitive than the Dune Strandveld area from an erosion and regional botanical point of view, it is highlighted as an area of potential sensitivity for which due care is required. Therefore it has been highlighted on Figure 9.1 above, but is not considered a 'no-go' area. It is recommended that a Search and Rescue exercise should locate any Red Data Book listed species plants before development and remove them to secure areas.

The areas illustrated on Figure 9.2 above which should be avoided (where possible) or alternatively subject to intensive ground-truthing prior to construction works beginning are clustered to the western corner of the site. These areas include:

1. The high local sensitivity area (Short Strandveld on clay soils) in terms of vegetation at the western corner of the site. This area supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*).
2. Two small wetlands which may be located within 50 m of a turbine and/or internal access road.
3. A concentration of small shell middens recorded at each of two dried springs that were once waterholes with potable water. The value of the waterhole-related sites is that they represent two complete systems of occupation which are of scientific value in terms of their potential to provide information about the cultural affinities of the people who lived there, and the time depth of their occupancy of the area.

The proposed construction activities include:

Site preparation and earthworks on site (including access roads)

Access road upgrade

Foundations – undertaken consecutively

Turbine components begin arrival in South Africa and are transported to site

Arrival of cranes on-site and crane assembly

Turbine erection and generator installation

Commissioning of each turbine

Substation construction

Power line construction

Visitors centre construction

The hours of operation for noisy construction activities are guided by the Environment Conservation Act (noise control regulations). If the project requires construction work outside of the designated hours, regulatory authorities and affected stakeholders will be consulted and subsequent negotiations will be made to ensure the suitability of the revised activities.

In terms of the findings of the EIA Report, various planning, construction and operation-related environmental impacts were identified, including:

- » Disturbance of ecological environment (flora and fauna)
- » Increase in traffic volumes in the vicinity of the construction site and impact on existing road infrastructure
- » Disturbance to sense of place, visual aesthetics

- » Light pollution
- » Noise pollution
- » Security risks
- » Socio-economic impacts
- » Erosion and windblown dust
- » Storage and utilisation of hazardous substances on-site
- » Impacts on water resources (sedimentation and water quality)

None of the construction phase impacts were deemed to have a highly significant impact on the environment, given their relatively short duration and localised extent. Many of the construction phase impacts were, however, assessed as being of medium significance and requiring specific mitigation interventions in order to avoid and minimise impacts on the biophysical and human environment.

The EMP has been developed 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 avoiding or minimising potential impacts.

STRUCTURE OF THIS EMP

CHAPTER 3

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

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

These chapters set out the procedures necessary for Eskom to achieve environmental compliance. For each of the phases for the Wind Energy Facility project, an overarching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management plan 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 plan 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 energy turbines » access roads » substation » 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

Where relevant, reference is made to site-specific or activity-specific guidelines appended to the EMP (refer Appendices A to H).

The objectives and EMP tables are required to be reviewed and possibly modified 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.
- » Relevant legal or other requirements are changed or introduced.
- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This draft EMP was compiled by:

EMP Compilers:	Karen Jodas	Savannah Environmental
	Jo-Anne Thomas	Savannah Environmental
Specialists:	Nick Helme - vegetation	Nick Helme Botanical Surveys
	Tim Hart - archaeology and heritage	Archaeology Contracts Office (ACO) Department of Archaeology: University of Cape Town
	Prof Mouton – fauna	Department of Botany & Zoology, Stellenbosch University
	Andrew Jenkins - ornithologist	Endangered Wildlife Trust (EWT)
	Garry Paterson – agricultural potential	Agricultural Research Council (ARC): Institute for Soil, Climate & Water
	Mark Rynhoud - Soils and erosion potential	Geological and Environmental Services (GES)
	Pete Illgner – geomorphology and wetlands	
	Lourens du Plessis - visual	MetroGIS
	Mark Pinder – traffic and transportation	Arup SA (Pty) Ltd
	Tony Barbour & Schalk van der Merwe - Social	
	Adrian Jongens - Acoustics	Jongens Keet & Associates (JKA)

	consultant	
<i>Eskom technical inputs:</i>	Morore Mashao	Eskom Generation Division: Divisional Client Office Manager – Chief Engineer
	Ian Smit	Eskom Corporate Division: EIRD – Chief Engineer
	Isaac Blou	Eskom Enterprises Division: Engineering Department – Engineer
	Dan Dukhan	Eskom Enterprises Division: Engineering Department – Civil Engineer
	Zuki Qina	Eskom Enterprises Division: Engineering Department – Civil Engineer
	Trevor Cairns	Eskom Enterprises Division: Capital Expansion Department – Project Manager
<i>Eskom environmental inputs:</i>	Nico Gewers	Generation Division: Generation Environmental Management – Chief Environmental Advisor
	Kubentheran Nair	Eskom Generation Division: Generation Environmental Management – Senior Environmental Advisor

Karen Jodas and Jo-Anne Thomas, the principle authors of this Environmental Management Plan, are both registered Professional Natural Scientists (in the practice of environmental science) with the South African Council for Natural Scientific Professions. They have extensive knowledge and experience in environmental impact assessment and environmental management, having being involved in EIA processes over the past ten (10) years. They have managed and drafted environmental management plans for other power generation projects for Eskom Holdings Limited throughout South Africa. In addition, they have both been involved in compliance monitoring of major construction projects in South Africa (including the De Hoop Dam project in Limpopo).

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: PLANNING & DESIGN

CHAPTER 4

4.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the 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 adequate regard has been taken of 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, including the power line alignment.
- » 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.

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

From the specialist investigations undertaken for the proposed wind energy facility development site, no absolute '*no go*' areas were identified. Nor were areas of *regionally* high or very high sensitivity identified.

However, potentially sensitive areas, including the clay hill area characterised by the Short Strandveld vegetation type, archaeological sites (with an approximate 30 m buffer for each site), as well as possible pans (with an approximate 50 m buffer) have been highlighted as being potentially affected by the facility. These areas are illustrated in Figure 2. The areas should be subject to intensive ground-truthing prior to construction works beginning to ensure that any areas within disturbance corridors are fully understood and demarcated to avoid unnecessary disturbance. These areas include:

1. The high local sensitivity area (clay hill) in terms of vegetation at the western corner of the site. This area supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*).

2. Two small wetlands which may be located within 50 m of a turbine and/or internal access road.
3. A concentration of small shell middens recorded at each of two dried springs that were once waterholes with potable water. The value of the waterhole-related sites is that they represent two complete systems of occupation which are of scientific value in terms of their potential to provide information about the cultural affinities of the people who lived there, and the time depth of their occupancy of the area.

In order to minimise potential impacts during construction on these three potentially sensitive areas within the site, the following recommendations have been made:

1. The extent of the high local sensitivity area (clay hill) at the western corner of the site should be accurately defined through a field survey/ground-truthing exercise by a suitably qualified botanist familiar with the vegetation of the area. This will determine:
 - a) if the area can be effectively avoided at the design stage through micro-siting relocation of the first three turbine positions (**turbine numbers 1-3**) and associated infrastructure within the impact corridor, or if the turbine positions require total re-positioning within the turbine field/site to avoid the area completely (best practice requires avoidance of impacts); or
 - b) how the positioning of infrastructure in this area can be undertaken with the least possible impact, and allow for a Search and Rescue program to be planned for any plants of concern that can be translocated, and to obtain any permits from CapeNature which may be required for the disturbance or translocation of Red Data/protected plants (refer Appendix A).

Although the placement of turbines and infrastructure in this area cannot be viewed as a fatal flaw, it is supported (from a best practice botanical perspective) that the impact be avoided or minimised to an acceptable level.

2. The crests of the aeolian dunes (which are typically poorly vegetated and represent a high erosion risk) should be avoided, wherever possible, for the siting of infrastructure such as internal access roads.
3. In order to ensure adequate buffer areas around the wetland areas on the site, **turbine number 62** and the associated access road (Row C) and the access road within Row B of turbines should be shifted at least 20 m and 10 m respectively within the impact corridor.
4. In order to minimise impacts on historical and archaeological heritage, the following must be considered:
 - a) a program of archaeological sampling of Late Stone Age archaeological sites of the two clusters of sites be undertaken, and
 - b) where technically possible, micro adjustment of turbine and road positions (**turbine numbers 29 and 30** in Row B; and **turbine numbers 61 and 62** in Row C) should be implemented.

All sampling should be undertaken ahead of construction work at the affected sites. Eskom will need to apply for sampling permits from Heritage Western Cape². The permit application will need to be accompanied by detailed specifications of which sites are to be sampled, how large the samples will be, and how and where the sampled material will be stored (the NHRA requires indefinite institutional storage of all archaeological remains). This information should be informed by the design of the facility. Once the archaeological sampling is completed, a permit for destruction of any remaining archaeological material on any of the development sites must be obtained from Heritage Western Cape.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	» Design fails to respond optimally to the environmental consideration
Activities/risk sources	<ul style="list-style-type: none"> » Positioning of turbines and access roads within 200 m corridor » Positioning of substation » Alignment of power line within 200 m corridor » Upgrading of Skaapvlei Road (DR2225)
Mitigation: Target/Objective	» To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, aquatic ecology (i.e. wetlands and pans), avifauna, and heritage, as detailed within the EIA report and relevant appendices.	Engineering Design Consultant/successful turbine supplier Eskom	Tender Design & Design Review Stage
Consider shifting of turbine numbers 1-3, and 62, as well as the access roads associated with turbine number 62 and Row B.	Engineering Design Consultant/successful turbine supplier Eskom	Tender Design & Design Review Stage
Balance technical and financial considerations against environmental constraints and opportunities in finalising the design of key elements.	Eskom	Tender Design & Design Review Stage

Performance Indicator	<ul style="list-style-type: none"> » Design meets objectives and does not degrade the environment » Design and layouts etc respond to the mitigation measures and recommendations in the EIA report.
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² The turn around period for the issuing of heritage permits by Heritage Western Cape is generally about 5 weeks. Permits are usually valid for a period of a year but can be extended for a further 2 years if required.

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, SHE representative and Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: To ensure selection of best environmental option for alignment/design of the power line

A double circuit 132 kV power line is proposed to connect the substation at the wind energy facility to the electricity distribution network/grid at the Juno Transmission Substation (outside Vredendal), a distance of approximately 40 km. Alternative routes/corridors for the 132 kV power line were identified and assessed in the EIA phase (refer to Figure 3).

From the results of the specialist investigations, Alternative 1 is nominated as the preferred power line alternative by the majority of specialist findings. Alternative 1a is also considered to be acceptable, with Alternative 2 being the least preferred.

An area of high botanical sensitivity north of Koekenaap has been identified to be traversed by Alternative 1. This area comprises significant patches of Very High sensitivity vegetation, mostly in the form of Knersvlakte Quartz Vygieveld. With the implementation of Alternative 1, an impact of very high significance on vegetation is anticipated in this area due to long-term to permanent loss of vegetation and habitat in quartz patches in this area. A power line through these highly sensitive quartz patches would cause significant and permanent damage in the form of plant loss due to crushing, and permanent habitat alteration. The fine covering of quartz pebbles is key to the habitat, and any heavy machinery severely disturbs this layer, effectively rendering the habitats unsuitable for these specialised plants for many decades after disturbance. Given that the quartz patches are fairly small and localised on a landscape scale, it is not considered acceptable to have infrastructure routed through them when they are relatively easy to avoid. The significance of this impact is not off-set by the fact that an existing disturbance occurs in the form of the existing power line. New impacts would develop with the introduction of new power line infrastructure.

The proposed power line alternatives are all considered to be acceptable from an environmental perspective, with **Alternative 1 with sub-alternative 1a** being considered as the preferred alternative and more appropriate for development in order to minimise impacts of unacceptably high significance on a botanically sensitive habitat. This alternative is further improved through the recommendations of officials when on-site, where a small deviation to Alternative 1 was recommended and accepted by all the environmental authorities when on site. the preferred power line alternative is illustrated in Figure 3.



Figure 3: Preferred power line corridors, as recommended in the EIA

Project component/s	Project components affecting the objective: » power line
Potential Impact	» Route that degrades environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, erosion, and impacts on local communities/residents
Activities/risk sources	» Alignment of power line within 200 m corridor
Mitigation: Target/Objective	» To ensure selection of best environmental option for alignment for the power line

Mitigation: Action/control	Responsibility	Timeframe
Select alignment that curtails environmental impacts and enhances environmental benefits (Alternative 1 with sub-Alternative 1a), while being technically feasible and affordable.	Eskom Distribution Lands and Rights	Prior to submission of Final EIA

Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, aquatic ecology (i.e. wetlands and pans), avifauna, and heritage, as detailed within the EIA report and relevant appendices.	Eskom Distribution design team	Design phase
Bird-friendly power line tower and conductor designs will be used.	Eskom Distribution design team	Design phase

Performance Indicator	<ul style="list-style-type: none"> » Alignment meets objectives. » Selected alignment minimises any negative environmental impacts and maximises any benefits.
Monitoring	<ul style="list-style-type: none"> » Ensure that the design implemented meets the objectives and mitigation measures in the EIA report through review of the design by the Project Manager, SHE representative and the ECO prior to the commencement of construction.

OBJECTIVE: To ensure adequate regard has been taken of landowner concerns and that these are appropriately addressed

Impacts on current and future agricultural activities were identified through the EIA process to be of potential concern. It is Eskom’s intention to purchase the three properties which comprise the 37 km² area. The end use of the property will be primarily for electricity generation (the property would be re-zoned to industrial in order to accommodate the facility). The option of granting grazing rights to the affected farmers would be required to be considered by Eskom. However, given the long regeneration periods for disturbances to the natural vegetation, it will take several seasons for the areas disturbed by the construction activities to recover to a state which is fit for grazing. This, combined with the low stock carrying capacity in the area (approximately 1 SSU/10 ha), will impact on the economic viability of the affected farms. It is recommended that an opinion from an agricultural-economist specialist be sought once the final footprint for the proposed wind energy facility is available in order to understand the impact on each of the affected farm owners, and to inform the negotiation process undertaken by Eskom with the affected landowners.

Land affected by a power line route is not purchased by Eskom. A servitude (a right of way) is required to be registered by Eskom for the establishment of the power line (approx 32 m wide), and the affected landowner is appropriately compensated.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads
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	<ul style="list-style-type: none"> » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Landowners impacted by proposed siting of facility, access road or power line » Impacts on current and future agricultural activities
Activities/risk sources	<ul style="list-style-type: none"> » Positioning of turbines, access roads and substation » Alignment of power line within 200 m corridor
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure adequate regard has been taken of concerns of affected and surrounding landowners and that these are appropriately addressed

Mitigation: Action/control	Responsibility	Timeframe
Initiate negotiations with landowners timeously.	Eskom Lands and Rights	Ideally initiated together with submission of final EIA (which indicates preferred site layout and power line route). Finalised prior to site establishment commencement.
Address reasonable expectations/requests of landowners, where possible.		
Seek an opinion from an agricultural-economist specialist in order to understand the impact on each of the three farm owners affected by the wind energy facility site in order to inform the negotiation process undertaken by Eskom with the affected landowners.		

Performance Indicator	<ul style="list-style-type: none"> » Location and layout responds to issues recorded in the Comments and Response Report included in the EIA. » Landowners should be satisfied with the outcome of the negotiations process. » Landowners should be afforded reasonable and appropriate rights/access.
Monitoring	<ul style="list-style-type: none"> » Not applicable

OBJECTIVE: To ensure the selection of the most appropriate road surface improvement option for Skaapvlei road (DR2225)

The additional construction traffic to the site has the potential to lead to premature failure of access roads, both surfaced and gravel, between the source and the site. The gravel roads may need regular grading to smooth out the surface, but may need to be re-gravelled after completion of the construction phase of the project to ensure a good driving surface.

In addition, in order to mitigate the impact of turning construction traffic and other vehicles using the R363 and ensure road traffic safety, it is recommended that the intersection (and possibly the first 1 800 m portion of the Skaapvlei road (DR2225)) be reconstructed to a bituminous surfaced road at the start of the construction phase. This would also assist in minimising the dust and noise impact on the residents of the agricultural smallholdings adjacent to this section of Skaapvlei road.

Project component/s	Project components affecting the objective: » Access road
Potential Impact	» Road surface deteriorates and is not safe for use » Deterioration of road results in unnecessary erosion and environmental degradation » Road traffic safety impacts at intersection with R363
Activities/risk sources	» Improvement to and maintenance of Skaapvlei road
Mitigation: Target/Objective	» To ensure the selection of the most appropriate road improvement option for Skaapvlei road

Mitigation: Action/control	Responsibility	Timeframe
Select improvement option that curtails environmental impacts and enhances benefits to other users of the Skaapvlei road, while being technically feasible and affordable and ensuring all properties along the Skaapvlei road has safe access to their properties.	Eskom and Western Cape Department of Transport and Public Works (District Roads Engineer)	Design phase
Undertake detailed pavement design for desired improvement option, as required.	Engineering Design Consultant, Western Cape Department of Transport and Public Works (District Roads Engineer) and Eskom	Detailed design phase

Performance Indicator	» Road improvement option meets objective. Selected option minimises negative environmental impacts and maximises any benefits.
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, SHE representative and Environmental Control Officer (ECO) prior to the commencement of construction activities.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: CONSTRUCTION

CHAPTER 5

5.1. Overall Goal for Construction

Overall Goal for Construction: Undertake the construction phase of the wind energy facility in a way that:

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents.
- » Minimises the impact on the vegetation and habitats value of the site and where possible adds to the botanical record of this area.
- » Minimises the impact on the archaeological and historical value of the site and where possible adds to the archaeological record of this area.
- » Minimises impacts on birds and other fauna using the site.
- » Establishes an environmental baseline during construction activities on the site, where possible, particularly with regard to priority bird species using the site.

Eskom guidelines which include Eskom Distributions standard Environmental Management Program (EMP) for construction of Distribution lines and substations, as well as Eskom's Guideline Environmental Procedure: Environmental Management Programme are attached as Appendices B and C respectively.

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

OBJECTIVE: Securing the site and site establishment

The Contractor must recognise that the site is situated in relatively close proximity to residences (albeit rural setting) and is bisected by a Provincial road, and must therefore take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans, Xhosa and any other relevant indigenous languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners and public » Security of materials
Activities/risk sources	<ul style="list-style-type: none"> » Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the SHE Representative.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Where necessary to control access, fence and secure area.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site establishment Maintenance: for duration of Contract

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry » No members of the public/ landowners injured
Monitoring	<ul style="list-style-type: none"> » Regular visual inspection of fence for signs of deterioration/forced access » An incident reporting system will be used to record non-conformances to the EMP (refer Appendix D for Eskom's environmental reporting procedure)

OBJECTIVE: Noise control

Noise levels during construction of the proposed development have been modelled and show compliance with the Noise Control Regulations and SANS Guidelines for all residential locations, including the closest locations at Skaapvlei.

Traffic movement to and from the wind energy facility site, particularly that of heavy-duty vehicles during construction, could potentially result in a noise impact on the residents of the agricultural smallholdings adjacent to the Skaapvlei road who are situated close to the road. In order to minimise the noise during vehicular movement during the construction and operation of the facility it is recommended that the portion of the Skaapvlei road to the facility that passes through these smallholdings be improved to consist of a lower-noise road surface.

Project component/s	List of project components affecting the objective: » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	» Nuisance noise from construction affecting the surrounding community
Activity/risk source	» Site preparation and earthworks » Construction-related transport » Foundations or plant equipment installation » Building activities » Power line construction activities
Mitigation: Target/Objective	» To minimise noise to any surrounding residences from the construction activities » To comply with Noise Control Regulations and SANS Guidelines » To ensure noise levels are acceptable at smallholdings adjacent to Skaapvlei road and other residences in close proximity to construction activities

Mitigation: Action/control	Responsibility	Timeframe
On-site construction activities will be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays) (in terms of the Environment Conservation Act). Should construction activities need to be undertaken outside of these times, the surrounding communities will be notified and appropriate approval will be obtained from DEAT.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Construction noise will be managed according to the Noise Control Regulations and SANS 10103.	Contractor	Duration of contract
All construction equipment, including vehicles, will be properly and appropriately maintained in order to minimise noise generation.	Contractor	Duration of contract

Performance Indicator	» No complaints received concerning noise
Monitoring	<ul style="list-style-type: none"> » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Management of dust and emissions to air

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on Skaapvlei road. The expected vehicle movements per day for the transportation of the wind turbine components to the site will be approximately 1 vehicle per day over a 1-year period. It is estimated that 2 570 ready-mix cement truck loads will be required to be transported to the site over a 2 year period for construction of the total facility (including the wind turbine foundations, substation and visitors centre).

The main access route to the site (i.e. Skaapvlei road (DR2225)) and the internal access roads will be gravel roads. Due to the arid nature of the area (i.e. low rainfall) and the prevailing windy conditions, dust from gravel roads, dust generated from construction activities on-site, as well as vehicle entrained dust have been identified as potential issues of concern which require management.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility

	<ul style="list-style-type: none"> » Release of minor amounts of air pollutants (for example NO₂, CO, PM10 and SO₂) from vehicles and construction equipment
Activities/risk sources	<ul style="list-style-type: none"> » Clearing of vegetation and topsoil » Excavation, grading, scraping » Transport of materials, equipment and components on Skaapvlei road and internal access roads » Re-entrainment of deposited dust by vehicle movements » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces » Fuel burning vehicle engines
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/control	Responsibility	Timeframe
Roads will be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Appropriate dust suppressant will be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered.	Contractor	Duration of contract
Speed of construction vehicles will be restricted, as defined by the SHE Representative.	Contractor	Duration of contract
Burning or incineration of any materials on-site will be prohibited.	Contractor	Duration of contract
Specific fire safety precautions will be implemented during welding activities associated with the substation and power line construction.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences.	Contractor	Duration of contract
Disturbed areas will be re-vegetated as soon as practicable.	Contractor	At completion of the construction phase
Vehicles and equipment will be maintained in a road-worthy condition at all times.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem will be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions
Monitoring	<p>Monitoring will be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> » Visual daily inspections of dust generation by construction activities throughout the construction phase. If considered necessary by the SHE Representative, dust gauges will be installed at nearby residences. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager or SHE Representative. » A complaints register will be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Erosion and sediment control and water quality management

Potential erosion risks that could occur in the study area as a result of the prevailing geological conditions include the following:

- » Unconsolidated sands with risk of erosion by both wind and water
- » Compressible soils and poor surface drainage where clayey soil conditions and flat grades prevail
- » Clayey material may be dispersive with associated erosion risk when exposed to the atmosphere
- » Ponding surface water and shallow perched water tables after wet periods - adequate stormwater drainage would be essential in such areas
- » Excavation sidewall stability and slope stability may be problematic where steep cuttings are exposed
- » Karstic weathering conditions cannot be ignored in calcareous settings although this risk is considered extremely low in light of the prevailing arid climatic conditions.

Erosion and soil loss will be associated with both wind and water. Impacts of wind-blown erosion will increase with increased disturbance to the vegetation cover. Intense rainfall periods will also result in significant soil loss. The provision of erosion/sediment control measures and water quality management is paramount.

During the construction phase, limited activities would have the potential for contaminated water to enter the groundwater system. The vulnerability of the groundwater resource in the vicinity of the development site to the proposed land use activity is mitigated by factors such as the substantial depth to groundwater level, the intergranular and fractured type of aquifer that underlies most of the site, and the poor yield of boreholes in the area. As this is particularly relevant to stormwater runoff, water quality impacts will be managed as part of the stormwater management system.

A guideline for sediment and soil management and erosion control is provided as Appendix E.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Erosion and soil loss associated with both wind and water » Contaminated water entering surrounding hydrological system
Activities/risk sources	<ul style="list-style-type: none"> » Water and wind erosion of cleared and excavated areas » Stormwater run-off from sealed surfaces » Accidental spills of petrochemical products (e.g. transformer oils associated with the operation of the substation and wind turbines) or cement on-site, or during transport of these products to the site
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise erosion of sediment on site and along gravel access roads during construction » To provide permanent erosion and sediment control measures, where required » To minimise the risk of contamination of surface water, groundwater and stormwater through leaks or spills of chemicals/polluting substances during the construction phase » To control disposal of potentially contaminated site water associated with the substation

Mitigation: Action/control	Responsibility	Timeframe
A Stormwater Management Plan, detailing location and design of stormwater and sediment control devices will be prepared and approved prior to the commencement of construction activities.	Contractor	Pre-construction
All possible stormwater and sediment control devices to	Contractor	Erection: during

Mitigation: Action/control	Responsibility	Timeframe
be constructed to the satisfaction of the administering authority. Stormwater and sediment control devices to be completed and effective in a designated area prior to the stripping of the topsoil, bulk earthworks on the site, service installation and/or road pavement construction.		site establishment Maintenance: for duration of contract
All stockpiles will be positioned away from drainage lines.	Contractor	During site establishment and any activity related to earthworks
Sediment fencing will be erected downslope of all stockpiles to intercept any sediment and upslope runoff should be diverted away from stockpiles.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Soil loss from the site is related to the time that the soils are exposed prior to rehabilitation/stabilisation activities. The time from commencement of construction to rehabilitation will be kept to a minimum to limit the period of surface exposure.	Contractor	Duration of contract
Disturbance of vegetation and topsoil will be kept to a practical minimum.	Contractor	Duration of contract
Retention of vegetation strips along the edge of roadways for all components of the project is important to reduce the area of disturbance and minimise the potential for sediment loss.	Contractor	Duration of contract
It may be necessary to use geotextiles and/or wind nets to limit wind erosion of exposed areas, where wind erosion could present difficulties and result in the loss of valuable topsoil. The use of shadecloth fences (e.g. wind nets of 0.75m high placed approximately 5m apart) may be necessary to limit wind erosion in excavated areas. These will be positioned and staked down, as appropriate (refer to Appendix F).	Contractor	Site establishment & duration of contract
A minimum period (as defined by the SHE Representative) will be allowed to lapse between opening and closing of trenches for cabling, etc. in order to protect against wind erosion.	Contractor	Duration of contract
Any stockpiles will be protected against wind erosion (e.g. surrounded by shadecloth fences or damped down on a regular basis).	Contractor	Duration of contract
Permanent drainage/stormwater run-off works for large areas/sealed surfaces will be provided as early as possible during site establishment.	Contractor	Site establishment & duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Vehicular traffic will be controlled during construction, confining access and roadways, where possible, to proposed or existing road alignments.	Contractor	Duration of contract
Culverts of adequate size will be provided across drainage lines for any roads established within the wind energy facility site and/or within the power line servitude.	Contractor	Erection: during site establishment Maintenance: for duration of contract
As far as possible, access to the wind energy facility construction site should be restricted to a single access point.	Contractor	Duration of contract
Access roads and/or tracks used during construction will be graded to a crown and provided with effective surface drainage to prevent run-off eroding adjacent areas.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Movement of vehicles on-site is to be on approved and formalised access roads only, which shall be adequately maintained throughout construction. Where temporary tracks are required (e.g. for use by crawler crane) these are to be ripped and rehabilitated as soon use of the track is no longer required.	Contractor	Duration of contract
Materials on-site which may contaminate surface or groundwater will be stored and handled in an appropriate manner.	Contractor	Duration of contract
Spill kits will be made available on-site for the clean up of spills and leaks of contaminants.	Contractor	Duration of contract
Spill response procedures will include removal/disposal of potentially contaminated water and soil.	Contractor	Duration of contract
Construction equipment will be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays will 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 will be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery will be stored in an appropriately sealed and banded area.	Contractor	Duration of contract
Oily water from bunds at the substation will be removed from site by licensed contractors.	Contractor	Duration of contract
Spilled cement will be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
site.		
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.	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
The sediment control and water quality structures used on-site will be monitored and maintained in a fully operational state at all times.	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 evidence of erosion is present in construction areas or along gravel access roads » Surface and groundwater meet required water quality guideline levels » No evidence of water pollution or excessive sedimentation
Monitoring	<ul style="list-style-type: none"> » Regular visual inspections of the construction areas and along gravel access roads » Fortnightly visual inspection of sediment and water quality control devices throughout construction phase and during or following major rain events. » Immediate reporting by personnel of damaged or ineffective sediment control measures or potential water contamination to Site Manager. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

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

A guideline for sediment and soil management and erosion control is provided as Appendix E.

Project component/s	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Impacts on natural vegetation » Impacts on soil » Loss of topsoil
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Trenching activities for cable laying » Excavation for tower base foundations » Construction of site access road » Site preparation for lay-down area and site office/visitor's centre (e.g. compaction) » Foundations or plant equipment installation » Track for crawler crane movement on-site » Power line construction activities » Stockpiling of topsoil, subsoil and spoil material
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain natural vegetation in the western corner of the site, where possible » To avoid the sensitive quartz patches located within the proposed power line corridor (Alternative 1) north of Koekenaap » To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas » Fill material is to be sourced from tower base excavations; spoil material to be minimised

Mitigation: Action/control	Responsibility	Timeframe
Areas to be cleared will be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation will be kept to a minimum so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Construction activities will be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
All fill material will be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from tower base excavations will be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil (top 25cm) will be stockpiled in laydown areas separate from base material and covered	Contractor	Site establishment &

Mitigation: Action/control	Responsibility	Timeframe
until replaced during rehabilitation. As far as possible, topsoil will not be stored for longer than 3 months.		duration of contract
Topsoil will not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
The maximum topsoil stockpile height will not exceed 2m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » Minimise clearing of existing vegetation
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of vegetation

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. There are no areas of *regionally* high or very high sensitivity on site, and no obvious concentrations of rare species or any especially threatened habitats or vegetation types. The development footprints will not impact on any botanical “no go” habitats or areas.

An area of high local sensitivity in terms of vegetation was recorded at the western corner of the site (clay hill). This area supports an unusual mix of species on heavier clay soils, including at least one Red Data Book listed species (*Leucoptera nodosa*).

An area of botanical sensitivity north of Koekenaap has been identified to be in the vicinity of the proposed power line route. There are significant patches of Very High sensitivity vegetation in this area, mostly in the form of Knersvlakte Quartz Vygieveld, which are required to be avoided and not disturbed.

A guideline for red data or localised plant species identification is included as Appendix A.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Clearing of construction footprints » Construction activities » Traffic to and from site
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities » Dumping or damage by construction equipment outside of demarcated construction areas.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain natural vegetation in the western corner of the site, where possible. » To avoid the sensitive quartz patches located within the proposed power line corridor (Alternative 1) north of Koekenaap » To minimise footprints of disturbance of vegetation/habitats on-site

Mitigation: Action/control	Responsibility	Timeframe
Areas to be cleared will be clearly marked in the field to eliminate unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
Undertake Search and Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in development footprints.	Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation will be kept to a minimum so that the impact on flora is restricted.	Contractor	Site establishment & duration of contract
All rescued species should be bagged (and cuttings taken where appropriate) and kept in an on-site nursery (if water can be provided; otherwise off-site) and should be returned to site once construction activities are completed and rehabilitation of a disturbed area is required.	Contractor in consultation with Specialist	Site establishment & duration of contract
A site rehabilitation programme must be implemented (refer Chapter 6).	Contractor in consultation with Specialist	Duration of contract
A weed eradication programme must be implemented, where necessary.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase » Monitoring of vegetation clearing activities in terms of permit conditions » Supervision of all clearing and earthworks » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of fauna

Natural wildlife is common on the site, but species diversity is low – small and medium bovids (springbok, steenbok and duiker), small carnivores (meerkat and aardwolf) along with numerous rodents, birds and reptiles were observed during the course of this study. The presence of faunal species is dictated by the habitats present on and adjacent to the development site, and includes Namaqualand Strandveld, Sand Fynbos, permanent, seasonal and ephemeral pans, cultivated lands (including the old cultivated areas located on the farm Skaapvlei, and existing lands adjacent to the Olifants River and tributaries), and alien trees (mostly eucalypts and acacias in areas crossed by the proposed power line route).

Impacts on terrestrial and avifauna as a result of construction activities are mainly associated with disturbance and habitat destruction.

Project component/s	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Vegetation clearance and associated impacts on faunal habitats » Traffic to and from site
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Construction-related traffic » Foundations or plant equipment installation » Mobile construction equipment » Power line construction activities
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

Mitigation: Action/control	Responsibility	Timeframe
Areas to be cleared will be clearly marked in the field to eliminate unnecessary clearing/disturbance.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation will be kept to a minimum so that impact on fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) will be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	Specialist	Pre-construction
A site rehabilitation programme should be implemented.	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities)
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks » Recording faunal fatalities to monitor success of relocation efforts » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of sites of heritage value

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

A concentration of small shell middens was recorded at each of two dried springs on the site that were once waterholes with potable water. The contents of the sites are varied – many are ephemeral limpet dominated shell scatters that are visible in what was more recently ploughed land. These middens probably represent short duration camps. At

least 3 of the sites are dense middens (even though they are some 3 km from the coast) and included fragments of animal bone. Stone artefacts are present on all sites. The raw materials used are wide ranging – notably quartz, crystal quartz, very high quality silcrete, hornfels, quartzite as well as cryptocrystalline silicates. The assemblages tend to be informal despite the high grades of raw material available. Ceramics are present on many of the waterhole-associated sites indicating that part of the occupation span took place within the last 2 000 years.

Disturbance corridors as well as turbine construction areas and footings will potentially destroy archaeological material. Turbine numbers 29 and 30 in Row B will directly affect an estimated 11 Late Stone Age shell middens; and turbine numbers 61 and 62 in Row C will affect a further 5. The effect of the proposed activities will be the further lateral and vertical disturbance of midden material, destruction of artefactual material and bone and mixing of any preserved stratigraphy.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line construction activities
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction will be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Specialist	Pre-construction
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	ECO/specialist	Pre-construction
Project employees and any contract staff will maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Eskom/Contractor	Duration of contract
If a heritage object is found, work in that area will be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	Eskom/Contractor in consultation with Specialist	Duration of contract

Apply for sampling permits from Heritage Western Cape for work on any archaeological sites identified as needing intervention – in other words any archaeological site that will be affected by the access road, crane track, laydown areas, turbine bases and cable trenches.	Eskom in consultation with Specialist	Pre-construction
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Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by ECO throughout construction phase » Supervision of all clearing and earthworks » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported Appropriate permits obtained from Heritage Western Cape prior to the disturbance or destruction of heritage sites » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Protection of wetlands/pans

Seven small (<1 ha in extent) pans occur on the proposed development site, the largest of these pans being located north of the Skaapvlei road (outside of proposed area of construction activity). The pans occur in a matrix of sandy soils, but are formed where the underlying clays come to the surface. The pans on this site do not appear to support any significantly different natural vegetation, which may be partly a result of disturbance in the form of heavy grazing. However, they have high ecological value, as the only natural open water sources in the area. These pans usually contain water for limited periods, typically during winter and spring, and may support numerous invertebrates, which attract wading birds such as spoonbills, ducks, etc. Many other birds visit the pans when they contain water, but the water is usually too saline for frogs.

Drainage lines and other wetland areas are afforded protection by a number of legal instruments in South Africa (including the National Environmental Management Act and the National Water Act). Development planned within these areas, will require approval from the relevant authorities tasked with policing a piece of relevant legislation.

Two small wetlands which may be located within 50 m of a turbine and/or internal access road have been identified on the site (refer to Figure 2). No drainage lines are

located on the proposed wind energy facility site, but several are crossed by the proposed power line corridor.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of wetland/pan habitat » Disturbance to or loss of riparian habitat » Sedimentation of watercourses/wetland areas
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line construction activities
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that any impacts on wetland/riparian habitats are minimised.

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction will be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor in consultation with Specialist	Pre-construction
All wetlands, drainage lines and associated buffer zones (viz. 50 m) should be excluded from the development footprint.	Engineering Design Consultant/Eskom	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas » Impacts on pans, wetlands, drainage lines and riparian areas (and associated buffer areas) are minimised
Monitoring	<ul style="list-style-type: none"> » Observation of site clearing activities by ECO throughout construction phase » Supervision of all clearing and earthworks » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Minimisation of visual impacts associated with construction

The construction phase of the wind energy facility and all associated infrastructure is approximated at roughly two years (one week per turbine) should all 100 turbines be erected. This is dependent on a number of external factors that may not always be controlled. During this time heavy vehicles, components, cranes, civils 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	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » substation » visitors centre » power line
Potential Impact	» Temporary visual intrusion
Activity/risk source	» Transportation of wind energy facility, substation and power line components to the site » Construction activities on-site and along power line corridor
Mitigation: Target/Objective	» Minimise contrast with surrounding environment and visibility of the construction activities to people in the area » To ensure that the facility complies with Civil Aviation Authority requirements for turbine and power line visibility to aircraft

Mitigation: Action/control	Responsibility	Timeframe
The activities and movement of construction workers and construction site vehicles will be restricted to the immediate construction site.	Contractor	Duration of contract
The general appearance of construction activities, construction equipment camps and lay-down areas will be maintained by means of the timely removal of rubble and disused construction materials.	Contractor	Duration of contract
Construction activities will be restricted to daylight hours (as far as possible) in order to negate or reduce the visual impacts associated with lighting. In the event that night-time construction activities are required to be undertaken, lighting will be placed in such a manner as to limit impacts on the surrounding areas.	Contractor	Duration of contract
The turbines will be painted a pale, matt, non-reflective colour (i.e. off white, as specified) and it will be ensured that the specified paint colour is complied with before erection of the turbines.	Contractor	Erection of turbines
Aviation warning lights will be mounted on turbine housing or such measures required by the Civil Aviation Authority.	Contractor	Erection of turbines
Appropriate aircraft markings will be placed on power line conductors, where required.	Contractor	Erection of power line
Clearance of vegetation within the development footprint will be minimised in order to minimise long-term visual disturbance, and rehabilitation efforts undertaken.	Contractor	Duration of contract

Performance Indicator	» No complaints regarding visual intrusion associated with construction activities
Monitoring	<ul style="list-style-type: none"> » Ensure that mitigation measures are implemented during construction to minimise visual impacts on surrounding communities » Ensure that aviation warning lights or other measures are installed before construction is completed » Ensure that aviation warning lights or other measures are functional at all times » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Traffic management and transportation of equipment and materials to site

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and external works outside the site boundary (i.e. DR2225 road improvement, widening of intersections, protection/accommodation of existing Eskom, Telkom and other municipal services, protection of existing road related structures on Provincial roads etc.). The existing roads which are mostly likely to be utilised include:

- » N7 (National road which will accommodate abnormal loads)
- » R363 (Provincial surfaced road which may require some improvement or protection to support abnormal loads)
- » DR2225 (Provincial gravel road which will require improvement to support abnormal loads)

The expected vehicle movements per day for the transportation of the wind turbine components to the site will be approximately 1 vehicle per day over a 1 year period. It is estimated that 2 570 ready-mix cement truck loads will be required to be transported to the site over a 2 year period for construction of the total facility (including the wind turbine foundations, substation and visitors centre).

During construction, the access (DR2225) and internal (to the facility) service roads must be improved/constructed to support 15 ton/axle loads to support the abnormal loads delivering the nacelles, crawler crane and other components. The crawler crane required for the erection of the wind turbines has a tracked width of 11 m when assembled.

The additional construction traffic to the site has the potential to lead to premature failure of access roads, both surfaced and gravel, between the source and the site. The gravel road may require regular grading to smooth out the surface, but may need to be re-gravelled after conclusion of the construction phase of the project to ensure a good driving surface.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » power line
Potential Impact	<ul style="list-style-type: none"> » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted » Risk of accidents » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads » Generation of dust and noise from increased vehicles moving on Skaapvlei road
Activity/risk source	<ul style="list-style-type: none"> » Traffic congestion increase at the Skaapvlei road/R363 intersection » Increased traffic movement (especially heavy/abnormal load vehicles) on Skaapvlei road » Traffic congestion from abnormal weight or sized loads on N7 and R363 between Cape Town and the site » Site preparation and earthworks » Foundations or plant equipment installation » Transportation of ready-mix cement from off-site batching plant to the site » Mobile construction equipment movement on-site » Power line construction activities
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise impact of traffic associated with the construction of the wind energy facility on local traffic » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To ensure all vehicles are roadworthy and all materials/equipment are carried appropriately and within any imposed permit/licence conditions

Mitigation: Action/control	Responsibility	Timeframe
A detailed assessment of road transport routes and vehicles will be undertaken through the preparation and implementation of a Traffic Management Plan for the construction phase. This plan will be submitted for Eskom and the Provincial Roads authority acceptance.	Contractor (or appointed transportation contractor)	Pre-construction
All relevant permits for abnormal loads will be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction

Mitigation: Action/control	Responsibility	Timeframe
No deviation from approved transportation routes will be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies will be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures. A management plan will be submitted for Eskom's acceptance.	Contractor (or appointed transportation contractor)	Pre-construction
Appropriate dust suppression techniques will be used to minimise dust emissions on unsurfaced roads.	Contractor	Duration of contract
Vehicle movements on local roads will be limited to standard construction operating hours wherever possible to limit noise impacts and dust nuisance.	Contractor	Duration of contract
Times for arrival and departure of heavy vehicles will be co-ordinated to minimise congestion on the local R363 road.	Contractor	Duration of contract
Any traffic delays as a result of construction traffic will be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
A designated access to the proposed site will be created to ensure safe entry and exit.	Contractor	Pre-construction
The movement of all vehicles within the site will be on designated roadways.	Contractor	Duration of contract
Signage will be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
All hazardous substances will be transported in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Appropriate maintenance of all vehicles will be ensured.	Contractor	Duration of contract
All vehicles travelling on public roads will adhere to the specified speed limits and all drivers will be in possession of an appropriate valid driver's license.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » No traffic incidents involving Eskom personnel or appointed contractors » No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the wind energy facility
Monitoring	<ul style="list-style-type: none"> » Visual monitoring of dust produced by traffic movement » Visual monitoring of traffic control measures to ensure they are effective » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances

to the EMP

OBJECTIVE: Appropriate handling and storage of chemicals and hazardous substances

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. Chemical storage is likely to occur within the substation site and workshop/laydown area (within the visitors centre complex).

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » substation » visitors centre/workshop » power line
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
Activity/risk source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks » Power line construction activities » Substation construction activities
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

Mitigation: Action/control	Responsibility	Timeframe
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files, as defined by the SHE Representative.	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
Hazardous waste handling and spill response training will be included for staff and contractors as part of site induction.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required will be obtained, and the conditions	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
attached to such permits and approvals will be compiled with.		
Routine servicing and maintenance of vehicles will 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, an appropriate drip tray will be used to contain any fuel or oils.	Contractor	Duration of contract
Transport of all hazardous substances will be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
MSDS records to be kept current for chemicals in use.	Contractor	Duration of contract
Waste disposal records will be available for review at any time.	Contractor	Duration of contract

Performance Indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas » No water or soil contamination by chemical spills
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Appropriate handling and management of waste

The construction of the wind energy facility will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification and management of wastes, along with industry principles for minimising construction wastes must be implemented.

The main wastes expected to be generated by the construction of the wind energy facility will include:

- » general solid waste
- » hazardous waste
- » liquid waste (including grey water and sewage)

A guideline to integrated management of construction waste is provided in Appendix G.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » access roads » substation » visitors centre/workshop » power line
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"> » Packaging » 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 comply with waste management guidelines » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Suppliers will be advised of Eskom's waste minimisation expectations (as defined by SHE Representative) with regards to packaging and other materials brought to site/requiring disposal.	Eskom, SHE Representative and Contractor	Duration of contract
Construction contractors will provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas will 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 will 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 will be reused or recycled. Bins and skips will be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc). A recycling plan will be developed in accordance with the requirements of the National Waste Management Strategy and submitted for Eskom approval (refer to Appendix G for recycling guidelines).	Contractor	Duration of contract
Untamated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Hydrocarbon waste will be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods will be kept to a minimum and will be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) will be maintained detailing the quantity, nature and fate of any regulated waste.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
An incident/complaints register will be established and maintained on-site.	Contractor	Duration of contract

Performance Indicator	<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	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout construction phase » Waste collection will be monitored on a regular basis » Waste documentation completed » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Ensure disciplined conduct of on-site contractors

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	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> » wind energy turbines » access roads » substation
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	<ul style="list-style-type: none"> » visitors centre » power line
Potential Impact	<ul style="list-style-type: none"> » Pollution/contamination of the environment » Disturbance to the environment
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
The terms of this EMP and the Environmental Authorisation will be included in all tender documentation and Contractors contracts.	Eskom	Tender process
No personnel other than night watchmen and shift security will be permitted to remain on the site overnight.	Contractor (and sub-contractor/s)	Duration of contract
Contractors will use chemical toilets/ablution facilities situated at designated areas of the site; no abluting will be permitted outside the designated area. These facilities will be regularly serviced by appropriate contractors.	Contractor (and sub-contractor/s)	Duration of contract
Cooking/meals will 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 will be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO, will disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract
Animals disturbed during construction activities should not be harmed but should be allowed to move off to an undisturbed area of the site.	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 EMP » No complaints regarding contractor behaviour or habits
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of Contractor practices throughout construction phase. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon » An incident reporting system will be used to record non-conformances to the EMP

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

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

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident

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

The **Project Manager** (Eskom's Representative) will:

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

The **Site Manager** (Eskom's On-site Representative) will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of the Environmental Management Plan.
- » Be fully knowledgeable with the contents of all relevant environmental legislation and Eskom environmental policies and procedures, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.

- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Confine activities to the demarcated construction site.

The **Safety, Health and Environment Representative** (SHE officer for Eskom) will:

- » Develop and compile environmental policies and procedures.
- » Develop and implement an Environmental Management System (EMS) for the facility.
- » Direct and liaise with the Environmental Control Officer (ECO) regarding monitoring and reporting on the environmental performance of the construction phase.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as DEAT and DEA&DP on environmental performance and other issues.

The **Environmental Control Officer** (ECO) will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specification. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Plan.
- » Be fully knowledgeable with the contents with all relevant environmental legislation and Eskom environmental policies and procedures, and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- » Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the site manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMP.

- » 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.

Contractors and Service Providers:

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

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

5.3. Detailing Method Statements

OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP.

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. 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:

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

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

5.4. Awareness and Competence: Construction Phase of the Wind Energy Facility

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

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. 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 EMP 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 EMP and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Records must be kept of those that have completed the relevant training.
- » Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations.

5.5. Monitoring Programme: Construction Phase of the Wind Energy Facility

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

A monitoring programme will be in place not only to ensure conformance with the EMP, 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 monitoring will be stipulated by the Environmental Authorisation. Where this is not clearly dictated, Eskom will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

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

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation

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

The Environmental Control Officer will ensure compliance with the EMP, and to conduct monitoring activities. The Environmental Control Officer must have the appropriate experience and qualifications to undertake the necessary tasks. The Environmental Control Officer will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities.

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

CHAPTER 6

6.1. Overall Goal for the Rehabilitation of Disturbed Areas

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

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

A guideline with specific pointers for the site/area is provided in Appendix H and Appendix F.

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

OBJECTIVE: To ensure rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations. The main areas therefore requiring rehabilitation will be the laydown areas adjacent to the turbines, the crane tracks alongside the permanent 6m wide roads, any cable routings where these fall outside the abovementioned areas, and disturbed areas around the substation and the planned visitors centre complex, and disturbed areas associated with the power line tower foundations or access road.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility (including temporary access roads and laydown areas) » power line servitude and service road for power line servitude
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
All temporary facilities, equipment and waste materials will be removed from site.	Contractor	Following execution of the works
Compacted areas that are no longer needed post-construction (e.g. laydown areas, and the crane tracks) will be ripped and scarified.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures will be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Stockpiled topsoil will be replaced in disturbed areas where rehabilitation is to be undertaken as a layer of at least 10 cm in thickness.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Disturbed areas will be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix in the appropriate season (refer Appendix H).	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas will be protected from wind erosion by the use of wind nets (refer Appendix F) and maintained until an acceptable plant cover has been achieved. Wind nets will aid in limiting wind erosion of exposed areas, where wind erosion could present difficulties and result in the loss of valuable topsoil. The use of shade cloth fences (e.g. wind nets of 0.75m high placed approximately 5m apart) will be positioned and staked down, as appropriate.	Eskom in consultation with rehabilitation specialist	Post-rehabilitation
All livestock will be removed from the site until rehabilitated area/plant cover has established to an acceptable level (the period could extend up to 5 years, depending on rainfall and rehabilitation success rate).	Eskom	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 acceptable plant cover achieved on
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	rehabilitated sites
	» Closed site free of erosion and alien invasive plants
Monitoring	» 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

**MANAGEMENT PLAN FOR WIND ENERGY FACILITY:
 OPERATION**

CHAPTER 7

7.1. Overall Goal for Operation

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

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » 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.
- » Minimises impacts on birds and other fauna using the site.
- » Monitors and evaluates the impacts of the wind energy facility on birds that frequent the area, in particular monitoring of bird strikes, bird nesting activities and water bird uses of the wetlands/ephemeral pans on the site.
- » Monitors the actual noise impacts of the wind energy facility.
- » Establishes an environmental baseline for wind energy facility sites in South Africa, particularly with regard to priority bird species using the site.

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

OBJECTIVE: Protection of vegetation

Indirect impacts on vegetation during operation could result from maintenance activities and the movement of people and vehicles on site.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility (including access roads) » substation and access to substation » visitors centre » power line and service road for power line servitude
Potential Impact	» Disturbance to or loss of vegetation and/or habitat
Activity/risk source	» Movement of employee and visitor vehicles within and around site

Mitigation: Target/Objective	<ul style="list-style-type: none"> » To retain natural vegetation in the western corner of the site, where possible » To maintain minimised footprints of disturbance of vegetation/habitats on-site » To ensure and encourage plant regrowth in areas of post-construction rehabilitation
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Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements will be restricted to designated roadways	Eskom	Operation
No new roads will be created	Eskom	Operation
Exiting roads will be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Eskom	Operation
An on-going weed eradication programme should be implemented, where necessary.	Eskom	Operation

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to vegetation » Continued improvement of rehabilitation efforts
Monitoring	<ul style="list-style-type: none"> » Observation of vegetation on-site by Site Manager » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation (6-12 monthly) compared to natural/undisturbed areas

OBJECTIVE: Maintenance of rehabilitated areas

In order to ensure the long-term environmental integrity of the site following construction, maintenance the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	<p>List of project components affecting the objective:</p> <ul style="list-style-type: none"> » wind energy facility (including access roads and laydown areas) » visitors centre » power line servitude and service road for power line servitude
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"> » Laydown areas » Access roads » Other disturbed areas
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure and encourage site rehabilitation of disturbed areas

Mitigation: Action/control	Responsibility	Timeframe
A botanist familiar with the vegetation of the area should monitor the rehabilitation success on an annual basis in August or September, and make recommendations on how to improve any problem areas	Eskom/Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Remove all livestock from the site until rehabilitated area has established	Eskom	Operation (up to 5 years post-construction)

Performance Indicator	» Successful rehabilitation of disturbed areas
Monitoring	<ul style="list-style-type: none"> » Monitoring of the rehabilitation success on an annual basis in August or September » On-going alien plant monitoring and removal should be undertaken on an annual basis

OBJECTIVE: Protection of avifauna and determine the impact of the operating wind energy facility on priority bird species

During operation of the facility, the threat of collision of avifauna with the turbine blades is the most 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 turbines in South Africa with which bird interactions have been monitored. Unlike more problematic wind energy facilities identified in other parts of the world, the proposed wind energy facility is not positioned overly close to any known avian fly-ways, and does not otherwise impose on a particularly bird-rich environment, so it is unlikely to result in significant numbers of avian casualties through collision with the turbine blades, or cause undue loss of habitat or disturbance to any locally, regionally or nationally important bird populations. However, it is essential that the bird interactions which do take place as a result of the establishment of the facility are fully documented, and that every opportunity to learn about birds and their interactions with wind energy facilities in the South African environment is fully exploited in order to begin recording baseline data for South Africa.

In addition, bird interactions with the power line can also be anticipated. These are, however, well researched in the South African context (through the EWT and Eskom partnership). In addition, as a result of long-term monitoring, Eskom are in a position to make use of 'bird-friendly' towers and conductor configurations for their power lines.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility (turbines) » power line
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 birds as a result of collision with the overhead power line » Electrocutation as a result of power line
Activity/risk source	<ul style="list-style-type: none"> » Spinning turbine blades » Overhead power line
Mitigation: Target/Objective	<ul style="list-style-type: none"> » More accurately determine the impact of the operating wind energy facility on priority bird species

Mitigation: Action/control	Responsibility	Timeframe
Bird-flappers will be fitted to aerial power line cabling, where required, by a suitably qualified ornithologist.	Eskom Distribution/specialist	Operation/maintenance
A site monitoring programme will be implemented for surveying bird movements in relation to the wind energy facility and fully documenting all collision casualties.	Eskom/specialist	Operation
An on-site monitor of bird turbine collision incidents will be designated for the duration of the operating phase.	Eskom/specialist	Operation
An ornithologist will be designated to provide input on monitoring and mitigation of bird collisions with the turbine blades. All bird collisions to be recorded and reported to a designated ornithologist.	Eskom/specialist	Operation

Performance Indicator	<ul style="list-style-type: none"> » No additional disturbance to avifaunal populations on the wind energy facility site » No additional disturbance to avifaunal populations along the length of the power line route » Continued improvement of avifaunal protection efforts
Monitoring	<ul style="list-style-type: none"> » Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades or power line » Regular inspections to monitor casualties from collisions - delegate a suitable on-site monitor to assess avian mortality associated with the facility and power line » Record all bird casualties that occur on-site as a result of turbine collisions, with accurate information on where, when and how collisions take place, and report all recorded incidents to the designated ornithologist

OBJECTIVE: Protection of terrestrial fauna

Indirect impacts on terrestrial fauna during operation could include disturbance and further habitat destruction as a result of maintenance activities and the movement of people and vehicles on site, and direct fatalities from vehicle movements on-site.

Bat mortality at wind energy plants has been reported world-wide. Bats occurring in the area may potentially suffer mortality from the rotor blades of the turbines when these animals forage at night. Excessive lighting at the facility may attract flying insects and therefore also bats, which may lead to increased mortality from collision with turbine blades.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility (including access roads) » substation and access to substation » visitors centre » power line and service road for power line servitude
Potential Impact	<ul style="list-style-type: none"> » Disturbance to or loss of fauna and/or habitat » Direct mortalities
Activity/risk source	<ul style="list-style-type: none"> » Movement of employee and visitor vehicles within and around site » Lighting attracting insects/bats
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To keep number of vehicle movements to a minimum » To maintain minimised footprints of disturbance of vegetation/habitats on-site » To minimise impacts on bats » To ensure and encourage site rehabilitation

Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements restricted to designated roadways.	Eskom	Operation
Adherence to reduced vehicle speeds (as prescribed by the SHE Representative) by any vehicles moving on the site to reduce potential for direct mortalities.	Eskom	Operation
Excessive lighting at the facility should be avoided.	Eskom/specialist	Operation and maintenance

Performance Indicator	<ul style="list-style-type: none"> » No further disturbance to faunal populations on the site » Continued improvement of faunal protection efforts
Monitoring	<ul style="list-style-type: none"> » Observation of faunal populations and incidence of road kill on-site access roads by SHE Representative/Environmental Officer » Observation and recording of bat mortality associated with the wind energy facility

OBJECTIVE: Minimisation of visual impacts

The most significant impact associated with the proposed wind energy facility and associated infrastructure is the visual impact on the natural viewshed of this region imposed by the components of the facility. Potentially uninterrupted exposure of the facility is largely contained within the 25 km buffer zone of the site. The majority of potentially uninterrupted exposure occurs within the 0 – 10 km zone. Visibility beyond the 25 km mark becomes scattered and broken and ultimately negligible as it nears the 50 km buffer distance.

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 bright 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.

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.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility (including access roads) » substation » visitors centre » power line and service road for power line servitude
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"> » Size/scale of turbines » Substation and associated lighting » Access roads » Power line » Other associated infrastructure (e.g. visitors centre)
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

Mitigation: Action/control	Responsibility	Timeframe
Aviation warning lights will be mounted on turbine hub or such measures required by the Civil Aviation Authority.	Eskom	Erection and maintenance
The turbines will be painted a pale, matt, non-reflective colour (e.g. light grey) and that the specified paint colour is complied with before erection of the turbines.	Eskom	Erection and maintenance
Use of light fixtures and the fitment of covers and shields will be designed to contain rather than spread light.	Eskom	Operation and maintenance
Appropriate aircraft markings will be placed on power line conductors, as required.	Eskom Distribution	Erection and maintenance

Performance Indicator	<ul style="list-style-type: none"> » Minimised visual intrusion on surrounding areas » Appropriate visibility of infrastructure to aircraft
Monitoring	<ul style="list-style-type: none"> » Ensure that aviation warning lights or other measures are installed before construction is completed » Ensure that Aviation warning lights or other measures are functional at all times

OBJECTIVE: Monitor the noise produced by the wind energy facility and its effects on local residents

The results of the noise impact assessment undertaken as part of the EIA indicate that there would be no impact of outdoor noise emanating from the wind turbines at the nearest noise sensitive area, Skaapvlei, and at all other noise sensitive land. However, low-frequency noise emanating from the turbines might have a low negative impact of low significance within dwellings at Skaapvlei.

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy facility
Potential Impact	<ul style="list-style-type: none"> » Noise from the turbines and other infrastructure on the site causes a disturbance to local residents, which cannot be mitigated.
Activity/risk source	<ul style="list-style-type: none"> » Turbines » Substation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To confirm that noise levels generated by the facility are within or below the levels predicted by the noise specialist in the EIA

Mitigation: Action/control	Responsibility	Timeframe
Services and maintenance activities will be scheduled so that there is minimal vehicle movement outside of working hours.	Eskom	Operation

Performance Indicator	» Noise levels monitored are within or below the levels predicted by the noise specialist in the EIA
Monitoring	» Follow-up noise measurements should be conducted under different weather and wind conditions (to be determined by the noise specialist) over the first year of operation

OBJECTIVE: 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 include:

- » general solid waste
- » hazardous waste
- » liquid waste

Project component/s	List of project components affecting the objective: <ul style="list-style-type: none"> » wind energy turbines » substation » visitors centre and workshop
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"> » Visitors centre » Office and workshop facilities » Generators and gearbox - turbines » Transformers and switchgear - substation » Water storage tank » Fuel and oil storage
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To comply with waste management guidelines » 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.	Eskom	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Eskom	Operation
All structures and/or components replaced during	Eskom	Operation

Mitigation: Action/control	Responsibility	Timeframe
maintenance activities will be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.		
Care will 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 will be cleaned up according to specified standards regarding bioremediation.	Eskom	Operation and maintenance
Waste handling, collection and disposal operations will be managed and controlled by a waste management contractor.	Eskom/waste management contractor	Operation
Wastewater: Water from bunds and oily water from oil/water separator will be removed by a licensed contractor.	Eskom/waste contractor	Operation
Used oils and chemicals: » Appropriate disposal will be arranged with a licensed facility in consultation with the administering authority. » Waste will be stored and handled according to the relevant legislation and regulations.	Eskom/waste management contractor	Operation
General waste will be recycled where possible or disposed of at an appropriately licensed landfill.	Eskom/waste management contractor	Operation
Hazardous waste (including hydrocarbons) and general waste will be stored and disposed of separately.	Eskom/waste management contractor	Operation
Regularly serviced chemical toilets and ablution facilities will be used on-site.	Eskom/waste management contractor	Operation
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Eskom	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate 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	<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 SHE Representative. All appropriate waste disposal certificates accompany the monthly reports.

7.2. Institutional Arrangements: Functions and Responsibilities for the Operational Phase of the Wind Energy Facility

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to an environmental incident

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Generation Environmental Manager, Wind Energy Facility Power Station Manager, and Environmental Officer for the operations phase of this project are as detailed below.

The **Generation Environmental Manager** will:

- » Provide overall assurance to the MD: Generation Division (and hence ultimately the CEO) that environmental issues are appropriately addressed and managed at the various business units (i.e. power generation stations).
- » Develop and implement strategies on various issues such as Environmental Management Systems, waste management, etc.
- » Be responsible for overall consolidation and reporting of environmental performance within the Generation Division.
- » Liaise on a strategic level with Government and other stakeholders on a range of issues.

The **Wind Energy Facility Power Station Manager** will:

- » Identify and appoint representatives from different departments of the facility. These employees shall be assigned the role of EMP drivers and shall collectively form the EMS management team with the environmental practitioner.
- » Ensure that adequate resources (human, financial, technology) are made available for the successful implementation and operation of the EMS.
- » Conduct annual basis reviews of the EMS to evaluate its effectiveness.
- » Take appropriate action as a result of findings and recommendations in management reviews and audits.

The **SHE Representative/Environmental Officer** will:

- » Implement an Environmental Management System (EMS) for the facility including the associated infrastructure.
- » Manage and report on the facility's environmental performance.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as DEAT and DEA&DP on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who maintain the Wind Energy Facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.

MANAGEMENT PLAN FOR WIND ENERGY FACILITY: DECOMMISSIONING

CHAPTER 8

The turbine infrastructure which will be utilised for the proposed wind energy facility is expected to have a lifespan of 20 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.

8.1. Site Preparation

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

8.2 Disassemble and Replace Existing Turbine

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will be reused, recycled or disposed of in accordance with regulatory requirements. All parts of the turbine would be considered reusable or recyclable except for the blades.