REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE ONE

APPENDIX B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/686

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

Revised by Zutari (Pty) Ltd
21 September 2020

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Updating of the Environmental Management Programme

Zutari (Pty) Ltd has been appointed to undertake an amendment application for the Umsinde Emoyeni Wind Farm. As part of the amendment application process, the Environmental Management Programme (EMPr) has been updated.

Minor changes have been made to the EMPr, dated January 2018, to cater for the amended project scope and to include additional mitigation measures identified by the specialist required for the proposed amendments. Additions to the EMPr have been underlined, and removed text is indicated with a ~~strikethrough.~~

The following points provide a summary of key changes made:

- Grammatical and typographic errors have been corrected
- Replacing project specifications with the proposed amendment specifications.
- Replacing the sensitivity map with a revised sensitivity map that shows the proposed re-optimised layout.
- Incorporating additional mitigation measures identified by the specialists (as described in the Umsinde Emoyeni Wind Farm Amendment Report, 2020)

ZUTARI

Glossary of Terms

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development

Contractor: Persons/organisations contracted by the Developer to carry out parts of the work for the proposed project

Engineer / Project Director (PD): Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environment: The environment is defined as the surroundings within which humans exist and that are made up of – the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental and Social Manager (ESM) also known as the Environmental Control Officer (ECO): Person/organisation appointed by the Developer who will provide direction to the Principal Agent concerning the activities within the Construction site. The ECO will also be responsible to liaise with the independent auditor who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme.

Independent Auditor: The person or entity who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme and Environmental Authorisation.

Environmental Management Programme (EMP): The EMP is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMP contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMP specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Therefore the EMP will be a working document, which will be reviewed when necessary, or if required by the authorities. A revision will be done once the detailed design of the proposed development has been completed.

Operational Phase (Post Construction): The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase: detailed final designs, micro siting, etc. will be undertaken.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement revegetation of a disturbed area and the insurance of a stable land surface. Revegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired

way, i.e. promote rapid vegetation establishment.

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase.

Project Area: This refers to the authorised area for the proposed development to take place. Farm portions numbers are outline in the EMP.

Local Community: People residing or present in the region and near the construction activities, including the owners and/or managers of land affected by construction, workers on the land, and people in nearby towns and villages.

Public: Any individual or group concerned with or affected by the Project and its consequences, including the local community, local, regional, and national authorities, investors, workforce, customers, consumers, environmental interest groups, and the general public.

Construction Area / Site: The land on which the Project is to be located. It includes the site, construction campsite, access roads and tracks, as well as any other area affected or disturbed by construction activities. The EMP (particularly the specifications for rehabilitation) is relevant for all areas disturbed during construction.

Access Roads and Tracks: All newly established roads and tracks, and areas cleared or driven over to provide access to/from the construction areas, and for the transportation of the construction workforce, equipment and materials.

Environmental Impact: The effect of an activity on the environment, whether desirable or undesirable. Undesirable or negative environmental impacts will result in damage and/or pollution of, or detriment to the environment, or in danger to the public, whether immediate or delayed.

Environmental Incident: An unexpected or sudden occurrence related to the Project, including major emissions, spills, fires, explosions, floods or erosion leading to serious or potentially serious negative environmental impacts.

Fugitive Dust: Can be defined as natural and/or human-associated dust becoming airborne due to the forces of wind or human activity.

Fauna and Flora / Plants and Animals: Any individual or group of micro-organisms, plants or animals.

General Waste and Construction Rubble It includes waste paper, board, cardboard, benign organic and domestic waste and uncontaminated construction debris such as used bricks, wood, waste concrete, unused subsoil and rubble from excavations or demolished structures.

Heritage Sites and Artefacts: Heritage sites and artefacts can be defined as any object or site of cultural, historical, archaeological or palaeontological significance found in or on the land. Historical objects are objects older than 50 years with architectural, historical, scientific, cultural, social, spiritual, linguistic, technological or aesthetic value. For example: buildings or parts thereof, graves or burial sites, milestones, numismatic objects (i.e. coins and beads), and military objects.

Archaeological objects include material remains resulting from human activity which are older than 100 years and which are in a state of disuse, such as tools, artefacts, human and hominoid remains and artificial features and structures.

Palaeontological objects include any fossilised remains of animals or plants.

Hazardous Substances: Substances which are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous waste includes, but is not limited to: human excrement, the by-products and wastes associated will the use of hazardous substances (i.e. used fuel, oil, lubricants and solvents), as well as items such as spent batteries, old oil filters, light bulbs, tyres, circuit boards, etc. which requires special collection and handling. When left abandoned, even substances such as scrap metal, wire, tins, broken glass and plastic could be harmful to people, wild and domestic animals. For example: plastic could be ingested by animals; people and animals could be injured by broken glass or metal objects; and animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Even if buried, such objects may become exposed over time due to wind erosion, scavengers or future human activities. Because of the sensitive nature of the area, these substances are all regarded as 'hazardous waste' for the purposes of this EMP.

Hydrological Features: Hydrological features include, but are not limited to:

- wetlands;
- open water;
- vegetated drainage channels;
- subterranean water;
- marine environments;
- estuarine environments.

Life Support Systems: Life support systems include, but are not limited to: an ecological system in which its outputs are vital for sustaining specialised habitats; an ecological system in which its outputs are vital for sustaining human life (e.g. water purification).

Mitigation: Environmental management measures designed to avoid, limit or remedy undesirable environmental impacts.

Monitoring: Structured observation, measurement and evaluation of environmental data over a period of time to assess the efficiency of environmental mitigation and rehabilitation measures.

Rehabilitation: Measures implemented to restore a damaged Environment.

Sensitive Sites: Environmentally sensitive sites include, but are not limited to:

- Areas with high conservation value due to the presence of important plant specimens, pristine habitats, high biodiversity, important water resources or heritage features and artefacts;
- Areas particularly prone to erosion once disturbed (i.e. steep slopes);
- Vulnerable areas with low potential for rehabilitation / slow rate of recovery (i.e. rock outcrops, steep slopes); and
- Areas in close proximity of sensitive receptors, such as farm homesteads, viewpoints or tourist stopovers.

Specialised habitats: Specialised habitats include, but are not limited to, areas which are:

- Priority breeding habitats;
- Refuge areas;
- Vital for species survival (important for, part, or all of its life cycle);
- Essential for species performance;
- Cryptic habitats, etc.

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1 INTRODUCTION

1.1 Background

Emoyeni Wind Farms Project (Pty) Ltd is proposing to develop a 140 MW wind energy facility, on a site near Murraysburg, on the border of the Western and Northern Cape Provinces, South Africa.

This document must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

The Environmental Management Plan (EMP) outlines measures to be implemented in order to minimise adverse environmental degradation associated with construction of the proposed development. It serves as a guide for the contractor and the construction workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction period.

1.2 Details of the Applicant and the Environmental Assessment Practitioner

Details of Applicant	
Project Applicant	Emoyeni Wind Farm ~~Propriety Limited~~ Project (Pty) Ltd
Company Registration	
Contact Person	Peter Venn
Postal Address	Postnet Suite No 216. Private Bag X26 Tokai 7966, Cape Town
Telephone	021 701 1292
Fax	
Email	Peter.venn@windlab.com

Environmental Assessment Practitioner (2018)	
EAP	Arcus Consultancy Services Ltd
Contact Person	Ashlin Bodasing
Qualifications	BSocSci Geography and Environmental Management
Postal Address	
Telephone	021 412 1529
Fax	None
Email	Office@arcusconsulting.co.za

Environmental Assessment Practitioner (2020)	
EAP	Zutari (Pty) Ltd
Contact Person	Charles Norman
Qualifications	MPhil Env Law
Postal Address	PO Box 509, George, 6530
Telephone	044 805 5428
Fax	044 805 5454
Email	Charles.Norman@zutari.com

1.3 Purpose and Aims of this Document

According to the Western Cape's Department of Environmental Affairs and Development Planning, Guideline for Environmental Management Plan (2005), and Environmental Management Programme (EMPr) is defined as "an *environmental management tool used*

to ensure that undue or reasonably avoidable adverse impact of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive beneifits of the project are enhanced."

This EMPr outlines measures to be implemented in order to minimise adverse environmental degradation and enhance positive impacts associated with wind energy facility. It serves as a guide for the contractor and the workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction and operational periods. The purpose of the EMPr is to:

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
- Minimise disturbance of the natural environment;
- Prevent pollution of land, air and water;
- Protect indigenous flora and fauna;
- Prevent soil erosion and facilitate re-vegetation;
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt the best practicable means available to prevent or minimise adverse environmental impacts;
- Identify and mitigate against any potential impact on ecology;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Train employees and contractors with regard to environmental obligations.

1.4 The Proposed Project

The proposed Umsinde Emoyeni WEF phase 1 will comprise no more than ~~35~~ 33 wind turbines each turbine having a maximum installed capacity of up to ~~4.5~~ 10 megawatts (MW). Turbines with a maximum height to tip of blade of ~~210~~ 250 m will be considered (hub height of ~~135~~ 160 m, rotor diameter up to ~~150~~ 180 m). The proposed project will be located on the north east portion of the WEF site boundary (Figure 1.1)

The WEF Phase 1 will have a contracted capacity of up to 140 MW, and an installed capacity of up to 147 MW in line with the REIPPPP.

The location of the turbines is presented in Figure 1.2. The proposed locations were identified based on the constraints and sensitivity mapping conducted during the scoping phase. This allowed placement of turbines, in areas of moderate to low sensitivity. The road and turbine layout was used by the specialists to inform their impact assessment reports and significance rating.

The grid site boundary connects the WEF with the Eskom Gamma substation. It should be noted that this is the same study area proposed for the grid infrastructure associated with the proposed Ishwati Emoyeni WEF (authorised by DEA). If the adjacent Ishwati Emoyeni WEF is awarded preferred bidder and constructed in advance of Umsinde Emoyeni, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect Umsinde Emoyeni to the national grid.

If awarded Preferred Bidder Status, the EWFP would enter into an implementation agreement with the DoE and a Power Purchase Agreement (PPA) with the buyer of the energy, which is in the majority of cases Eskom. Once operational the electricity would be

sold to Eskom under the PPA at the agreed bid price. Eskom then distribute the energy through the national grid to the energy users.

1.5 Proposed Project Infrastructure Components

The proposed project will comprise the following components as described below. It should be noted as the final design of the proposed project is not yet finalised, all dimensions are maximums as is required by the EIA process. The final design may include infrastructure which is of equal or less than dimensions to those stated below but not more than.

1.5.1 Turbines

The proposed project will consist of up to a maximum ~~35~~ 33 turbines. At this stage it is envisaged that the turbines will each have a capacity to generate ~~4.5~~ 10 MW of power and each turbine will have a maximum height to blade tip of ~~210~~ 250 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to ~~135~~ 160 m and a rotor diameter of up to ~~150~~ 180 m. A typical wind turbine is presented below (Plate 1). The exact turbine model has not been selected yet and will be subject to competitive tendering after further wind analysis has been completed. The turbine model will depend upon the technical, commercial and site specific requirements.

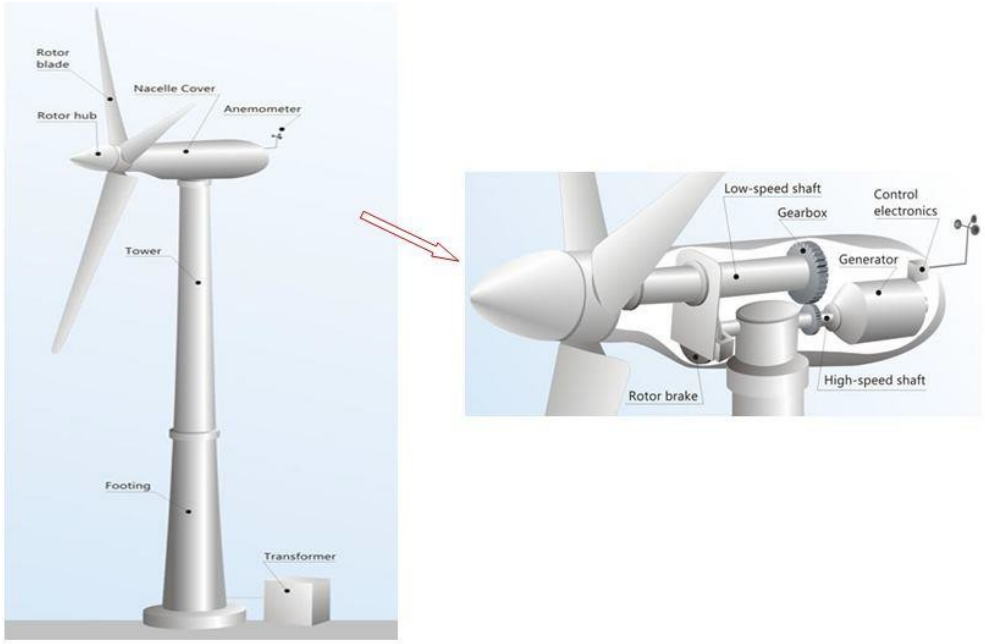


Plate 1 Typical Components of a Wind Turbine

The turbine rotor speed will vary according to the energy available in the wind, the wind speed. The turbines will generate power in wind speeds between approximately 3 metres per second (m/s) and 28 m/s (depending on the model of turbine) with maximum power output usually achieved at wind speeds of around 10 – 12 m/s. At average wind speeds greater than approximately 28 m/s the turbines would will automatically turn the angle of the blade to reduce energy capture (this is known as 'pitching') and stop turning to prevent damage.

Each turbine will require a transformer and, depending on the selected model of turbine, this will be either located within the turbine tower or adjacent to the turbine on a concrete plinth.

The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 30 m by 30 m in total[1] (which includes the maximum total area that may need to be disturbed during construction of the foundation), and be typically up to 3 m deep and may include concrete and steel plinths depending upon local ground conditions.

Once construction is complete, much of the foundation area can be rehabilitated.

1.5.2 Hardstanding Areas

A hardstanding area of up to ~~45~~ 55 m by ~~25~~ 35 m will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

1.5.3 Laydown Areas

Up to three additional temporary laydown areas of up to 150 m by 60 m in size will be required for equipment and component storage during construction. These areas will be levelled and compacted and used for component storage.

1.5.4 Electrical Cabling and Onsite Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to a 33/ 132 kV onsite substation. Where feasible and possible this will be underground. The onsite substation will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid. At this stage it is not clear which components of the onsite substation, will be transferred to ESKOM, as part of the grid connection, and transmission and distribution, therefore the substation, is included in all four applications and assessed in all four impact assessments. Typical example of a substation is shown below (Plate 2).

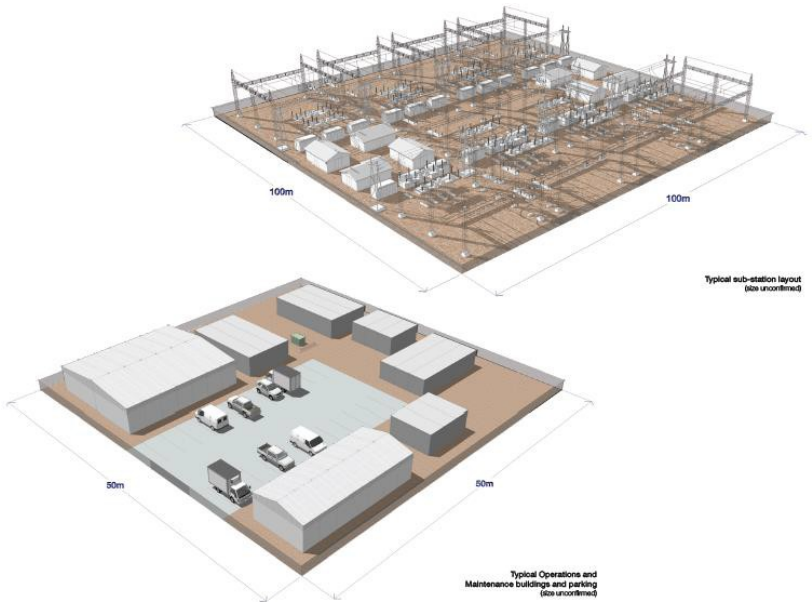


Plate 2 Typical Substation Layout

1 Note this includes an increase in the 20 m by 20 m stated on the application forms submitted in April 2014. The 20 m by 20 m is the approximate area of the turbines foundation, however an area of up to 30 m by 30 m will need to be cleared for the installation of the turbines base, as such for the EIA we will be assessing a worst case scenario of 30 m by 30 m. Whilst this is an amendment to the application form it does not alter the Listed Activities applied for and will be assessed as the worst case at the EIA stage.

1.5.5 Access

The turbine locations will be accessed through a network of unsealed tracks which will be established across the project site. These access tracks will be up to ~~9~~ 12 m wide during construction, depending on local topography, but will be reduced to between 4 m and 6 m during operation. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access tracks will be upgraded and utilised where possible, as will existing watercourse crossings. No borrow pits will be established on site. All material required for the construction of the proposed project will be imported to site.

1.5.6 Compound

There will also be an on-site office compound, including site offices, parking and an operation and maintenance facility including a control room.

1.5.7 Ancillary Equipment

In addition to the key components outlined above, the WEF will also require:

- Anemometer masts;
- Security fencing; and
- CCTV monitoring towers.

2 LEGAL FRAMEWORK

An application for Environmental Authorisation, in term of the National Environmental Management Act, Act 107, 1998 (NEMA), Environmental Impact Assessment Regulations, 2010, was submitted to the Department of Environmental Affairs in April 2014 and authorised on 6 September 2018. This section of the draft EMPr has been updated by Zutari (Pty) Ltd to include changes in relation to the 2020 amendment. ~~will need to be updated to include the recommendations and requirements that are outlined in the Environmental Authorisation, should this project be authorised by the DEA~~.

Table 2.1 includes the listed activities as authorised. Refer to the Amendment Report by Zutari (2020) which shows the 2014 listed activities as further amended.

Table 2:1: The NEMA EIA Regulations Listed Activities Applicable to the Proposed WEF

2010 NEMA EIA Regulations			**2014 NEMA EIA Regulations**		
#	**Description of Listed Activities**	**Triggered**	**#**	**Description of Listed Activities**	**Triggered**
GN R.544 10 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	**NO** 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.	GN R.983 11 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	**NO** 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.
GN R.544 11 (iii) (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m² in size; or (xi) infrastructure or structures covering 50 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	**YES** The internal roads will include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*	GN R.983 12 (iii) (x) and (xi)	The construction of- (iii) bridges exceeding 100 square meters in size; (x) buildings exceeding 100 square meters in size; (xii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs – (a) within a watercourse; or (c) if no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	**YES** The internal roads include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. Some of these may exceed 100 m^2. The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*
GN R.544 13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 m³.	**NO** Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m^3.	GN R.983 14	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres but not exceeding 500 cubic metres.	**NO** Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m^3.

GN R.544 18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	**YES** New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	GN R.983 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	**YES** New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse
GN R.544 23 (ii)	The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares;	**NO** The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, road and electrical reticulation, on-site office and substation will be more than 20 hectares.	GN R983 27	The clearance of an area of 1 hectares or more but less than 20 hectares of indigenous vegetation, except where such clearance is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	**NO** The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, on-site office and substation will be more than 20 hectares.
GN R.544 24	The transformation of land bigger than 1000 m² in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning.	**NO** There is no land zoned as open space, conservation or equivalent within the proposed development site.	GN R983 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	**YES** The majority of the proposed development site is currently used for agriculture, lies outside an urban area and the land to be developed will be bigger than 1 hectare.
GN R.544 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	**POSSIBLY** At present this section of the NEMBA is not yet defined so it does not apply at this time.	GN R.983 30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	**POSSIBLY**
GN R.544 27 (ii)	The decommissioning of existing facilities or infrastructure, for – (ii) electricity transmission and	**NO** No existing facilities or infrastructure for electricity	GN R.983 (i), (ii)	The decommissioning of existing facilities, structures or infrastructure for (i) any	**NO**

	distribution with a threshold of more than 132kV.	transmission or distribution will be decommissioned.	(iii), (iv) and (v)	development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iii) any development and related operation activity or activities and expansion and related operation activity or activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i), (ii), (iii), or (iv) above; and (b) is still in operation or development is still in progress	No existing facilities, structures or infrastructure will be decommissioned.
GN R.544 38	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	**NO** An expansion of transmission capacity at Gamma Substation will be required at the tie in to the national grid but the development footprint will not increase.	GN R.983 47	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	**NO**
GN R.544 39 (iii)	The expansion of (iii) bridges; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	**YES** The internal roads will include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded.	GN R.983 48 (iii)	The expansion of (iii) bridges where the bridge is expanded by 100 square meters or more in size; where such development occurs – (a) within a watercourse; (b) in front of a development setback; or (c) if no developments setback exists, within 32 metres of a	**YES** The internal roads include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded. Some of these may exceed 100 m^2.

				watercourse, measured from the edge of a watercourse.	
GN R.544 47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km – (i) where the existing reserve is wider than 13,5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	**Yes** Where roads are present and may require widening for access reasons during construction this clause may be applicable. However, it is unlikely that any large roads will be affected.	GN R.983 56 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 kilometre – (i) where the existing reserve is wider than 13.,5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	**Yes**
GN R.545 1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	**YES** Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 MW each.	GN R.984 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	**YES**
GN R.545.15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 Ha or more.	**YES** The project is located on currently undeveloped land the combined footprint of the turbines, laydown areas, internal roads and substation will exceed 20 hectares.	GN R.984 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance plan.	**YES**
GN R.546 4	The construction of a road wider than 4 m with a reserve less than 13.5 m (d) In Western Cape: (ii) All areas outside urban areas;	**YES** Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be	GN R.985 4	The development of a road wider than 4 metres with a reserve less than 13.5 metres. (f) in Western Cape: (i) areas outside urban areas; (aa) areas containing indigenous vegetation	**YES** Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be

		reduced to max. 6 m width during operation. The proposed site falls outside of urban areas.			reduced to max. 6 m width during operation. The proposed site falls outside of urban areas and contains indigenous vegetation.
GN R.546 10	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 m^3 (e) In Western Cape: (ii) All areas outside urban areas;	**NO** Storage of fuel on the site will be required however the volume of this storage is will be below 30 m^2.	GN R.985 10	The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.	**NO**
GN R.546 12 (b)	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) Within critical biodiversity areas identified in bioregional plans	**NO** Critical Biodiversity Areas (CBAs) were identified during the EIA process and considered in the layout of the proposed development, so that no roads or turbines will fall within a CBD. Some of the proposed turbine positions are on the border of a CBA, however any clearance of vegetation required surrounding these will not exceed 300 m^2	GN R.984 12 (a) (ii)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (a) In Western Cape province*:* (ii) Within critical biodiversity areas identified in bioregional plans	**NO**
GN R.546. 13 (a) (b) (c) (bb) (cc)	The clearance of an area of 1 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority (b) National Protected Area Expansion Strategy Focus Areas (NPAESFA)	**NO** Clearing of vegetation within a CBA will not exceed 1 Ha. The study area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, however clearing of vegetation within this will not exceed 1 Ha.	GN R.984 15 (c) (i)	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010 (c) in Western Cape: (i) Outside urban areas	**NO** The proposed development site does not include any land zoned as open space, conservation or equivalent.

	(c) In the Northern Cape and Western Cape: ii. Outside urban areas, in (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA); (cc) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority				
GN R.546 14 (a) (i)	The clearance of an area of 5 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous Vegetation….(a) In Western Cape: (i) All areas outside urban areas.	**YES** Clearance of vegetation will be required for construction of the turbine foundations, hardstands, substation and road network in areas with 75 % or more of indigenous vegetation and this will exceed 5 ha.			
GN R.546 16	The construction of: (iii) buildings with a footprint exceeding 10 m² in size; or (iv) infrastructure covering 10 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse; (d) In the Western Cape: (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	**NO** A 32m buffer was applied to all watercourses during the design phase as embedded mitigation, so that no construction of buildings or infrastructure will take place within this buffer.	GN R.984 14 (iii) (x) and (xi) (a) and (c) (f) (i) (bb) and (ff)	The development of (iii) bridges exceeding 10 square meters in size; (x) buildings exceeding 10 square metres in size and (xi) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse and (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. (f) In Western Cape: (i) outside urban areas, in: (bb) National Protected Area Expansion	**YES** Bridges may need to be constructed over watercourses exceeding 10 m² in size. The development site area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, no development will occur in this area. No required water crossings fall within a Critical Biodiversity Area.

				Strategy Focus (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	
GN. R.546 19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (d) In the Western Cape: (ii) All areas outside urban areas	**YES** Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4-9m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation.	GN R.984 18 (a)	The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre (f) In Western Cape: (i) All areas outside urban areas: (aa) Areas containing indigenous vegetation	**YES**

3 ENVIRONMENTAL IMPACT ASSESSMENT

The EMPr has been developed based on the findings and recommendations of the EIA (Arcus, 2015) and has been updated with the recommendations of the proposed amendment (Zutari, 2020).

3.1 Summary of Findings

During the EIA process, impacts on both the biophysical and socio-economic environments were assessed. The following specialist's studies were commissioned based on the sensitivities of the site and the potential impacts of the proposed development:

- Visual;
- Terrestrial Ecology (Flora and Fauna);
- Bats;
- Wetlands and Freshwater;
- Birds;
- Soils, Land Use and Agricultural Potential;
- Heritage and Palaeontology;
- Noise; and
- Socio-Economic.

From the assessment, it is evident that the construction and the operation of the WEF and grid connections will have both positive and negative ~~impacts both~~ social and environmental impacts but appropriate mitigation measures have been applied to reduce negative impacts ~~are outweighed by~~ and enhance the positive impacts. Overall the project has a positive economic impact regionally and for South Africa as a whole as power generated from the WEF will feed into the National Eskom grid, create job opportunities, and contribute to the local and regional economy.

3.2 Assessment of Alternatives

Different alternatives ranging from site location, transportation, design, turbine technologies, and the No Development alternative have all been considered for the proposed WEF. When considering the alternatives the applicant needs to consider environmental, social and economic factors and technical factors. Considering the above mentioned factors, EWFP intends to use the best available technology to satisfy these factors.

The preferred site was chosen based on the following: because the site is located within an area that has a good wind resource, the four components of the proposed development have been located in the sections of the site that are of low-medium areas of ecological sensitivity. The No Development alternative was identified as a high negative social cost to South Africa in terms of the country meeting its energy needs with clean, renewable energy, and a medium negative social cost in terms lost employment and business opportunities, and the benefits associated with the establishment of a Community Trust.

The No Development scenario is that the Umsinde Emoyeni WEF: Phase 1 cannot be constructed. This result will include the following:

- The land-use remains agricultural with no further benefits derived from the implementation of a complementary land use;
- There is no change in the current landscape or environmental baseline;
- Whilst no WEF development will occur on site, other wind energy projects go ahead as planned for other areas locally;

- No additional electricity will be generated onsite or supplied through means of renewable energy resources. This would have implications for the South African Government in achieving its proposed renewable energy target;
- There is no opportunity for additional employment ~~(albeit temporary)~~ in the local area where job creation is identified as a key priority; and
- The local Economic Development benefits associated with the WEF development's REIPPPP commitments will not be realised.

The No Development alternative was not considered feasible in the context of the proposed development and the needed power that will be generated from this renewable resource.

3.3 Summary of the Impact Assessment

Potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. Negative impacts of the proposed project on the biophysical environment include clearing of vegetation that leads to habitat fragmentation, potential loss of species of concern, soil erosion, surface water pollution; while social-economic impacts being minimal loss of agricultural land, disruption of social relations within the proposed area by the introduction of contractor workers from different areas, spread of diseases, loss of potential heritage resources and impact on sense of place.

All impacts have been identified and assessed at different stages (design/planning, construction, operation and decommission) and possible mitigation measures assigned to ensure low significance (for negative impacts) or high significance (for positive impacts).

4 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMPr and outlines the specific mitigation measures for those key impacts identified in the section above.

4.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the National Environmental Management Act (No. 107 of 1998) which states that development must be socially, economically and environmentally sustainable. Sustainable development requires that:

- The disturbance of ecosystems and loss of biodiversity are avoided (minimised or remedied);
- Pollution and degradation of the environment are avoided or minimised and remedied; Waste is avoided or minimised and re-used or re-cycled where possible and otherwise disposed of in a responsible manner;
- A risk averse and cautious approach is applied;
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

The Act makes provision that anyone who causes pollution or degradation of the environment is responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

4.2 Roles and Responsibilities for Good Environmental Management

The developer, together with the appointed contractor will be responsible for environmental management on site during the construction and operational phases of the proposed development. Specific roles and responsibilities are highlighted in the table below.

Developer Representative – Environmental Manager

- Review and approve EMPr prior to authorisation by ~~DEA~~ DEFF.
- Review and approve any EMPr updates or amendments.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the site environmental control officer during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appointment a suitably qualified independent environmental control officer during the construction phase.

Principal Contractor Representative - Environmental Control Officer

An independent environmental consultant will arrange for inspections of the construction activities and EMPr implementation throughout the construction phase. After each inspection, the ECO will produce a monitoring report that will be submitted to the client ~~DEA~~ DEFF and Western Cape Environmental Department (DEADP). Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The Environmental Control Officer (ECO) will be responsible for overseeing the implementation of the EMP during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the contractor with the EMP, record-keeping and updating of the EMP as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMP;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMP are communicated to the contractor, all site staff, and the contractor and /or site manager are made aware of the contents of the EMP, through presentations and discussions;
- Ensure that compliance to the EMP is monitored by regular and comprehensive inspection of the site and surrounding areas;
- Report on any incidents of non-compliance and ensure mitigation measure are implemented as soon as practical.

During *construction*, the Environmental Control Officer will be responsible for the following:

- Meeting on site with the Construction Manager prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities during construction to ensure adherence to the specifications contained in the EMP, using a monitoring checklist that is to be prepared by an independent environmental assessment practitioner at the start of the construction phase;
- Preparation of the monitoring report based on the site visit;
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager; and
- Maintain an Incidents Register and Complaints Register on site.

During *operation*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMP for the operation phase;

- Ensure that the necessary environmental monitoring takes place as specified in the EMP;
- Update the EMP and ensure that records are kept of all monitoring activities and results; and
- Maintain an Incidents Register and Complaints Register on site.

During *decommissioning*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMP for the decommissioning phase; and
- Conducting an environmental inspection on completion of decommissioning and "signing off" the site rehabilitation process.

4.3 Training and Induction of Employees

The contractor has a responsibility to ensure that all personnel involved in the project are aware of and are familiar with the environmental requirements for the project. The EMP shall be part of the terms of reference (ToR) for all contractors, sub-contractors and suppliers. All Contractors have to give some assurance that they understand the EMP and that they will undertake to comply with the conditions therein. All senior and supervisory staff members shall familiarise themselves with the full contents of the EMP. They shall know and understand the specifications of the EMP and be able to assist other staff members in matters relating to the EMP.

The Contractor must ensure that all staff working on site has an environmental induction. The presentation can include the following topics;

- What is meant by "Environment"?
- Why the environment needs to be protected and conserved.
- How construction activities can impact on the environment.
- What can be done to militate against such impacts?
- Awareness of emergency and spills response provisions.
- Social responsibility during construction e.g. being considerate to local residents.

A detailed environmental management and training program must be developed. The purpose of this is to ensure that all staff and workers understand what is required of them. The main components of the program can incorporate the following:

- Concept of sustainability and the reasons for good environmental management and practice
- Potential environmental impacts
- Mitigation measures
- Establishing a chain of responsibility and decision making
- Specific training requirements of certain staff, and the potential hazardous associated with the job.
- Methodologies to be used for field sampling
- Training in the use of field equipment
- Training in identification of non-compliance situations and procedures to be followed in such instances
- Reporting requirements
- Fire management
- HIV/AIDS

4.4 Complaints Register and Environmental Incidents Book

The Contractor must record any complaints received from the community. The complaint must be brought to the attention of the site manager and Environmental Control Officer, who will respond accordingly.

The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and,
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident,
- Actions taken and by whom.

4.5 Construction Environmental Monitoring

Environmental audits must be undertaken by an independent environmental consultant who will act as the Environmental Control Officer twice monthly, and on a daily basis or what is deemed necessary by the ECO during times of heavy earth works and vegetation clearing, in order to ensure compliance of all aspects of the EMP.

In order to facilitate communication between the ECO and the Resident Engineer and Contractor, it is vital that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMP may be justified as failure to comply with instruction from the highest authority.

4.6 Dealing with Non Compliance with the EMP

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMP. It may be possible that the contractor and or the developer put in place procedures to motivate staff members to comply with the EMPr and to deal with non-compliance. The developer must make this known to the contractor at the earliest stage possible, even during the tender phase.

4.7 EMP Amendments and Instructions

No EMP amendments shall be allowed with the approval of ~~the DEA~~ DEFF. Amendments may be possible, following discussions with the relevant ECO or environmental consultant, who may propose EMP amendments on behalf of the developer or issue EMP instructions, corrective actions, remediation or rehabilitation. These correction actions must be completed within the specified timeframes.

5 DESIGN PHASE / PRE–CONSTRUCTION PHASE MITIGATION MEASURES

The objectives of the pre-construction phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management;
- To ensure suitable environmental training and induction to all contractors, sub-contractors and labourers; and
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.

Mitigation measures for Legal Compliance.

- Appoint an independent environmental control officer

- Appoint an internal environmental co-ordinator or environmental officer, to oversee day to day environmental activities.
- Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.
- Before construction begins, all areas to be developed must be clearly demarcated with fencing, by a qualified surveyor.
- The contractor must ensure compliance with conditions described in the environmental authorisation.
- No construction camps are allowed on site. No workers are allowed to stay overnight in the construction area.
- Confirm with ECO, suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. All construction equipment must be stored within this construction camp and all associated oil changes etc. (no servicing) must take place within this camp.
- Unskilled labourers should be drawn from the local market.
- Training of site staff.
- Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.
- Project Manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.

The developer must ensure that the following mitigation measures are applied to the proposed project prior to the construction phase. These measures must be included in an updated EMPr to be submitted to the ~~DEA~~ DEFF for approval.

Prior to the submission of the final layout plan to the ~~DEA~~ DEFF for approval, the following specialists must visit the site to assist with the micro-siting the layout and do a walkthrough of all power lines:

- Flora and fauna specialists
- Avifaunal specialist
- Palaeontologist

Following the selection of turbine to be used for the project, the developer must update the layout plan for Phase 1, this together with the following management plans, to be developed, must be submitted to the ~~DEA~~ DEFF for approval:

- Traffic Management Plan – this plan will include the necessary arrangements to transport all equipment and infrastructure to site, including the necessary road transport permits.
- Construction Site Traffic Management Plan – this will be in the form of a site layout, showing the flow of traffic during the construction phase taking into consideration existing land users.
- Storm water Management Plan – once the final layout plan has been produced the appointed responsible engineers must produce a storm water management plan for the site, during the construction and operational phases of the project.
- A health and safety plan must be drawn up to ensure worker safety.

The construction of the WEF will result in water crossings for the expansion of existing and / the construction of new bridges over water courses. The developer must ensure that Water Use Licences are applied for and approved, prior to the start of construction. All mitigation measures proposed in the water use licence must be adhered to and included in an updated EMPr and submitted to the ~~DEA~~ DEFF for approval.

Develop a Project Layout and Access Plan to show the intended use of the area. The plan shall clearly indicate and/or describe the location and details of:

- Servitudes.
- Areas and routes to be cleared – including the size / width of the cleared areas.
- The construction campsite and rest areas to be used during construction.
- Waste disposal sites to be used during construction.
- Sources of construction materials.
- Power supply during construction.
- Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas.
- New tracks deemed necessary to provide access to construction activities.
- Any informal residential structures found within the property.
- Affected land use, 1:50 year floodlines.
- Sensitive areas.

5.1 Method Statements

Prior to construction the developer must ensure that the contractor supply the following method statements:

- Vegetation clearing;
- Cement mixing;
- Hazardous waste management;
- Emergency preparedness and response;
- Hazardous spills clean up;
- Topsoil stockpiling management;
- Laydown area management;
- Hazardous materials management;

5.2 Site Establishment

The object of site establishment is to ensure that an appropriate site is selected for the construction camp/site office and that the site office is managed in an environmentally responsible manner with minimal impact on the environment.

Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan[2]. The Construction Site Office Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size / quantity / capacity and design of:

- Access routes;
- Ablution facilities (including details on the handling of sewage and wastewater);
- On-site waste management facilities (waste containers, etc.);
- Design of bunds and other structures for containment of hazardous substances;
- Fencing;

[2] To form part of the Project Layout and Access Plan.

- Water storage and supply;
- Power supply (for cooking, space heating, lighting, etc.);
- Fire extinguishers, first aid kit and any other relevant safety equipment;
- Other structures and buildings (offices, storerooms, workshops, etc.);
- Other storage areas and stockpiles (i.e. topsoil, construction materials, equipment, etc.);

Location of areas to be reinstated upon completion of the construction period, providing measures to be used for reinstatement.

- An area within the site must be demarcated for a construction site office, which will include storage area. This area must be fenced off.
- Site establishment shall take place in an orderly manner and all required amenities shall be installed at the lay down area before the main workforce move onto site.
- The construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction.
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at a registered landfill.
- Potable water for use by on site workers must be made available on a daily basis at the site office and the working areas on site.
- A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.
- The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.

Siting, Establishing and Management of Storage Material and Facilities

- Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Storage areas must be designated, demarcated and fenced.
- Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by children / animals etc.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s).
- These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the Engineer.
- Any water that collects in the bund must not be allowed to stand and must be removed immediately and the hydrocarbon digestion agent within must be replenished.
- All legal compliance requirements with respect to Fuel storage and dispensing must be met.
- All fuel storage tanks (temporary or permanent) and associated facilities must be designed and installed in accordance with the relevant oil industry standards, SANS codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations

- Flammable fuel and gas must be well separated from all welding workshops, assembly plants and loading bays where ignition of gas by an accidental spark may cause an explosion or fire.
- The tank must be erected at a safe distance from buildings, boundaries, welding sites and workshops and any other combustible or flammable materials.
- Symbolic safety signs depicting “No Smoking”, “No Naked Flames” and “Danger” are to be prominently displayed in and around the fuel storage area.
- The capacity of the tank must be clearly displayed and the product contained within the tank clearly identified.
- There must be adequate fire-fighting equipment at the fuel storage and dispensing area or areas.
- The storage tank must be removed on completion of the construction phase of the project.
- All such tanks to be designed and constructed in accordance with a recognised code (international standard).
- The rated capacity of tanks must provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks must be sealed and stored in an area where the ground has been protected.
- Any electrical or petrol-driven pump must be equipped and positioned so as not to cause any danger of ignition of the product.
- If fuel is dispensed from 200 litre drums, the proper dispensing equipment must be used.
- The drum must not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank must be stored in a waterproof container when not in use.
- All waste fuel and chemical impregnated rags must be stored in leak-proof containers and disposed of at an approved hazardous waste site.
- The amounts of fuel and chemicals stored on site must be minimised.
- Storage sites must be provided with bunds to contain any spilled liquids and materials.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Clear signage must be placed at all storage areas containing hazardous substances / materials.
- Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Storage areas containing hazardous substances / materials must be clearly signed.
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.
- A suitable Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.
- All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.
- Any spillage, which may occur, shall be investigated and immediate action must be taken.

6 CONSTRUCTION PHASE MITIGATION MEASURES

The following sections form the core of the EMPr during the construction phase of the proposed development. The developer is to ensure that the contractor complies with all mitigation measures during the construction period. The major sources of potential impacts include, the turbine footprint construction, the construction of buildings and infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

The following is not allowed on site:

- No poaching of any animals or harvesting of any flora;
- No construction camp, for workforce accommodation is allowed on site; contractors are to ensure suitable housing for staff outside of the proposed development footprint.
- No cooking or fires allowed on site;
- No alcohol or drugs are allowed on site;

6.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the proposed WEF. Specific mitigation measures for each impact is presented in the table below.

- The accidental, negligent, or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well-being of people, plants and animals.
- Excessive noise could be made by the construction activity which would affect neighbouring communities.
- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.
- Disturbance to local hydrology from construction activities.
- Pollution of surface water bodies
- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
    - Demolition of concrete foundations and existing buildings;
    - Grading / movement of soil;
    - Transportation and unloading of construction materials;
    - Vehicular movement over unsurfaced roads and tracks; and,
    - Wind erosion of stockpiles.
- Construction activities will result in the exposure of the soil to erosive factors, i.e. wind and water, and the compaction of the soil in other areas;
- Illegal poaching and collection of animals and plant material.
- Loss of established indigenous and exotic habitat
- Unnecessary trampling of vegetation and harm to animals.
- Degradation of the scenic quality due to the major earthworks and any unsightly structures.
- Damage or loss of important cultural, historical or pre-historical sites and artefacts.
- Damage to existing roads and tracks, power lines, pipelines, etc.
- Dangerous conditions near road.
- Trespassing and illegal access onto land.

The table below presents a summary of the potential impacts as assessed by specialists, and amended in 2020, for the construction phase of Phase 1 of the WEF.

Summary of Construction Phase Impacts

Environmental aspect	Impact	Without mitigation	With mitigation
Construction			
Geology soils and agriculture	Turbine footprint construction	Low (-)	Low (-)
	Construction of buildings and infrastructure	Low (-)	Low (-)
	Construction of roads	Low (-)	Low (-)
	Vehicle operation and spillages	Low (-)	Insignificant (-)
	Dust generation	Low (-)	Insignificant (-)
Terrestrial ecology (flora and fauna)	Impacts on vegetation and listed or protected plant species resulting from construction activities	High (-)	Medium (-)
	Alien plant invasion risk	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Very low (-)
	Direct faunal impacts during construction	Medium (-)	Low (-)
Wetlands and freshwater ecology	Loss of riparian systems and watercourses	Medium (-)	Low (-)
	Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function	Medium (-)	Low (-)
	Increase in sedimentation and erosion within the development footprint	Medium (-)	Low (-)
	Impact on localised surface water quality	Medium (-)	Low (-)
Avifauna	Habitat destruction	Medium (-)	Low (-)
	Disturbance and displacement	Low (-)	Very low (-)
Bats	Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction	Medium (-)	Insignificant (-)
	Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction	Medium (-)	Low (-)
Socio-economic	Creation of employment and business opportunities	Low (+)	Medium (+)
	Benefits associated with providing technical advice to local farmers and municipalities	N/A (n)	Low (+)
	Improved cell-phone coverage	Low (+)	Low (+)
	Presence of construction workers and potential impacts on family structures and social networks	Medium (-)	Low (-)
	Influx of job seekers	Low (-)	Low (-)
	Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Low (-)	Very low (-)
	Increased risk of veld fires	Medium (-)	Low (-)
	Impact of heavy vehicles and construction activities	Medium (-)	Low (-)
	Loss of farmland	Low (-)	Very low (-)
Heritage	Impacts to archaeological material and rock engravings (Pre-colonial heritage)	Low (-)*	Very low (+)* Very low (-)*
	Colonial heritage	Medium (-)	Medium (+)
	Cultural landscape / setting	Medium (-)	Medium (-)

Environmental aspect	Impact	Without mitigation	With mitigation
	Palaeontology: Disturbance, damage or destruction of well- preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)	Medium (-)	Low (+)
			Low (-)
Visual	Construction of turbines	Low (-)	Low (-)
Noise	Construction noise	Very low (-)	(No rating)

* These impacts represent the revised impacts as assessed during the 2020 Amendment Process

Table 6:1 Construction Phase Mitigation Measures

Mitigation Measure	Responsibility	Frequency
Route Clearing		
Off-road driving and the creation of new tracks, other than those described during Project Layout and Access Plan, are prohibited and will be regarded as unwanted tracks or unwarranted disturbed areas. All unwanted tracks or unwarranted disturbed areas shall be properly rehabilitated	Contractors engineer will be responsible for the creation of new roads. The ECO will be responsible for monitoring this activity	During site establishment Monthly thereafter.
When a new path is created: Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.	Site engineer/site manager ECO to monitor	Monthly
Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).	ECO to monitor Site engineer/site manager	
Keep tracks as narrow as possible and only drive on marked out routes (as per the Layout and Access Plan).		
No bulldozers will be used in bush clearing outside of the construction footprint. Only inflatable tyre earthmoving equipment must be used to reduce damage to vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If obstacles are far enough apart, divert the track around obstacles. Only obstacles that could interfere with the safe construction and operation of the development need to be removed.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Where possible, remove obstacles by hand. Shrubs are to be cut or crushed rather than being completely uprooted in areas where landscaping or rehabilitation will be undertaken on completion of the construction. Leave vegetation in place wherever possible, especially around the perimeter of the site to provide screening and habitat. Indigenous plants can be planted to replace alien vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Only undertake earthworks in an area if it is unavoidable, and keep the size of platforms as small as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
Sensitive sites within the construction area must be demarcated to avoid accidental destruction of sensitive areas. The workforce must be made aware of these areas, and why they are sensitive.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impacts on vegetation and listed or protected plant species resulting from construction activities		
Preconstruction walk-through of the facility in order to locate species of conservation concern that can be avoided or translocated as well as comply with the provincial permit conditions.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
Alien Plant Invasion Risk		
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
The recovery of the indigenous grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increased Erosion Risk		
Dust suppression and erosion management should be an integrated component of the construction approach.	ECO to monitor Site engineer/site manager	Weekly
Regular monitoring for erosion problems along the access roads and other cleared areas.	ECO to monitor Site engineer/site manager	Weekly
Erosion problems should be rectified on a regular basis.	ECO to monitor Site engineer/site manager	weekly
Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season	ECO to monitor Site engineer/site manager	monthly
A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
and promote post-disturbance recovery of an indigenous ground cover.		
Disturbance near to drainage lines or the pan should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Direct Faunal Impacts		
All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises	ECO to monitor Site engineer/site manager / safety officer	During site establishment Monthly thereafter.
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Avifaunal Habitat Destruction		
Prior to construction, the avifaunal specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling	ECO to monitor Site engineer/site manager	Prior to construction

Mitigation Measure	Responsibility	Frequency
activities around avian breeding and/or movement of schedules, and lowering levels of associated noise.		
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off road driving.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Any clearing of stands of alien trees on site should be approved first by an avifaunal specialist.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by and included within the EMPr.	ECO to monitor Site engineer/site manager	Post construction
All contractors are to adhere to the EMPr and should apply good environmental practice during construction.	ECO to monitor Site engineer/site manager	Throughout construction
A sensitivity map is attached to this EMPr as Appendix 1, areas identified on the map as 'no-go' areas for the placement of turbines must be strictly adhered when micrositing.	ECO to monitor Site engineer/site manager	Design phase
Avifaunal Disturbance and Displacement		
The maximum generation capacity of the development should be met through the deployment of fewer, larger turbines as far as practically possible; Should fewer turbines be required to meet the maximum generation capacity of the development than the number authorised, the turbines closets to 'no-go' areas and those in areas identified as being of Medium collision risk by the VERA model must be the first up for consideration to forgo where practically possible.	ECO to monitor Site engineer/site manager	Design phase
Consultation with the South African Civil Aviation Authority (SACAA) should be undertaken to determine the potential mitigation measure of painting one WTG blade per turbine black or other similar proven mitigation measures to further reduce the risk of bird collisions, this mitigation measure is recommended at the facility should SACAA agree to its implementation.	ECO to monitor Site engineer/site manager	Design phase

Mitigation Measure	Responsibility	Frequency
It is recommended that tracking of sub-adult and non-territorial adult Verreaux's Eagles be considered in close consultation with BLSA and an academic institution to gain a better understanding of the movement of these birds across the landscape, should the timing and utility of such a study be considered to be of value by those institutions. *Note: This research is not a requirement for the amendment authorisation however the data collected would be valuable to the scientific community and also be used to inform any post-construction mitigation that may be required.*	Developer to consider	Design phase
The appointed Environmental Control Officer (ECO) must be trained by the avifaunal specialist to identify the potential priority species and red data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of red data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify red data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the red data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 1 km of the breeding site must cease, and the avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	ECO to monitor Site engineer/site manager	Monthly and when required.
An avifaunal specialist must conduct nest searches of all suitable cliffs and/or tree nesting sites within 1 km of the Phase 1 and Phase 2 WEFs footprints that were not surveyed as part of the pre-construction cliff surveys. This additional survey must preferably be prior to construction commencement or as soon as possible thereafter. The aim will be to locate nest sites, so that these may continue to be monitored during the construction and operation phase, along with the monitoring of already identified nest sites.	ECO to monitor Site engineer/site manager	Pre-construction, post final design
Nests of Verreaux's Eagle must be monitored for breeding activity as per the Verreaux's Eagle guidelines.	ECO to monitor Site engineer/site manager	As per specialist requirements

Mitigation Measure	Responsibility	Frequency
Appoint a specialist to design and conduct monitoring of the breeding of Verreaux's Eagle and Martial Eagle at all identified nest sites that are within 5 km of a turbine position. This should be done at least three times during a calendar year during construction, optimally spaced before, during and after the breeding season of large eagles. Where possible, this monitoring can be combined with the additional nest surveys described above.	ECO to monitor Site engineer/site manager	As per specialist requirements.
Construction phase monitoring must be undertaken as recommended by the Verreaux's Eagle guidelines and must include vantage point surveys.	ECO to monitor Site engineer/site manager	As per specialist requirements
Additional vehicle based transects of the project site and control site must be conducted once per season over four seasons prior to the commencement of construction activities with the aim of recording the status of Blue Crane to allow for more reliable BACI analyses to be conducted.	ECO to monitor Site engineer/site manager	Prior to construction
No construction activities are allowed within in 1 km of nests during the breeding season (May, June, July and August) as per the Verreaux's Eagle guidelines[3].	ECO to monitor Site engineer/site manager	Throughout construction
Excavated rock piles must be removed after the construction phase to avoid increasing the prey population on the facility to reduce the chances of attracting Verreaux's Eagles into the project site during operation phase.	ECO to monitor Site engineer/site manager	Post construction
Bat Roost disturbance and/or destruction and bat fatalities		
~~Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~Design phase~~
~~Clearing of natural and agricultural areas be kept to a minimum.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~During site establishment~~ ~~Monthly thereafter.~~

[3] Ralston-Paton, S. 2017 Verreauxs' Eagle and Wind Farms Guidelines for impact assessment, monitoring, and mitigation. BirdLife South Africa, Johannesburg, South Africa)

Mitigation Measure	Responsibility	Frequency
~~Blasting activities not to occur within 2km of any known bat roosts.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~During blasting activities~~
~~Dust suppression measures to be used during the full construction phase~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~Weekly~~
~~Any new roosts discovered, should be reported and incorporated into the adaptive management plan.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~Monthly and as required during construction~~
~~Roost searches to continue during construction and operational phases.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~As required by the specialist~~
Avoid High and Medium-High sensitive areas. Ensure that all laydown areas, turbine bases, blades and hardstands, office and sub-stations are only situated in Low-medium or otherwise (preferably not) Medium sensitivity areas. This is already implemented as shown in Appendix 1.	ECO to monitor Developer to implement Site engineer/site manager	Design phase
Prioritise dropping turbines in closest proximity to High, Medium-High ad Medium sensitive areas (in descending priority) and/or on the periphery of the WEF (to reduce its overall footprint), if fewer than 33 turbines are developed. Refer to Appendix 1.	ECO to monitor Developer to implement Site engineer/site manager	Design phase
Minimise road impacts. Do not construct roads within 500 m of a confirmed roost. Minimise clearing and degradation of all natural (especially wetland and riparian) and agricultural areas, and obtain a water use license for each watercourse crossing. Effectively rehabilitate all 12 m wide roads to 6 m after construction.	ECO to monitor Site engineer/site manager	Pre-construction and design phase
Avoid blasting within 2 km of a confirmed roost.	ECO to monitor Site engineer/site manager	During blasting activities
Minimise artificial lighting. Apart from compulsory civil aviation lighting, minimize artificial lighting especially high-intensity, steady burning, sodium vapour, quartz, halogen and other brighter lights at substations, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination.	ECO to monitor Site engineer/site manager	Design phase
Minimise degradation of terrestrial habitat and water resources (especially near bat roots). Implement and maintain effective	ECO to monitor	Monthly during construction

Mitigation Measure	Responsibility	Frequency
invasive alien plants, storm water erosion, sediment and dust control measures.	Site engineer/site manager	
Turbines must be fitted with bat detectors and deterrent devices. Turbine engineers must consult with bat specialist to incorporate the necessary turbine adaptations for this during design phase so that there are no unexpected surprises or concerns after the turbines are built.	Site engineer/ site manager Developer to implement ECO	Design phase
Perform acoustic bat monitoring during construction. A detector(s) should be installed on at least one meteorological mast just before construction commences, and monitoring should occur through construction (and into operation).	ECO to monitor Site engineer/site manager	As per specialist requirements.
Report any new discovered roosts and incorporate their protection into the WEFs adaptive management plan.	ECO to monitor Site engineer/site manager	As and when roosts discovered.
Best practice (not essential): Continue performing roost searches during construction.	ECO to monitor/ Site Engineer	As per specialist requirements.
No construction of turbines within 200m of any building or substation.	Site Engineer	Design phase.
Loss of riparian systems and water courses		
Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No vehicles to refuel within drainage lines/ riparian vegetation.	ECO to monitor Site engineer/site manager	Weekly
During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control if required.	ECO to monitor Site engineer/site manager	monthly
Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increase in sedimentation and erosion within the development footprint		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on localized surface water quality		
Strict use and management of all hazardous materials used on site.	ECO to monitor Site engineer/site manager	Weekly
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	ECO to monitor Site engineer/site manager	Weekly
Containment of all contaminated water by means of careful run-off management on the development site.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Strict control over the behaviour of construction workers.	ECO and safety to monitor Site engineer/site manager	Weekly
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the EMPr for the project and strictly enforced.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.	ECO to monitor Site engineer/site manager	Weekly
Wind turbines Visual Impacts		
Visually sensitive peaks, major ridgelines and scarp edges, including 500m buffers, to be avoided, because of silhouette effect on the skyline over large distances.	Site engineer/site manager	Design phase

<table>
<tr><th>Mitigation Measure</th><th>Responsibility</th><th>Frequency</th></tr>
<tr><td>Recommended Buffers
<table>
<tr><th>Landscape features/criteria</th><th>PGWC Guide-lines (2006)</th><th>Recommended visual buffer guidelines (2014)</th></tr>
<tr><td>Project area boundary</td><td>-</td><td>270m (subject to turbine specification).</td></tr>
<tr><td>Ephemeral streams/ tributaries</td><td>-</td><td>250m</td></tr>
<tr><td>Perennial rivers, wetland features</td><td>500m</td><td>500m</td></tr>
<tr><td>Major ridgelines, peaks and scarps</td><td>500m</td><td>As per visual informants map, subject to micro-siting. (500m recommended for peaks).</td></tr>
<tr><td>Local roads</td><td>500m</td><td>500m</td></tr>
<tr><td>Local district gravel roads</td><td>review if scenic</td><td>1 to 3km (can be less if outside the viewshed).</td></tr>
<tr><td>R63 arterial route</td><td>review if scenic</td><td>1 to 3km (can be less if outside the viewshed).</td></tr>
<tr><td>Farmsteads (inside the project site)</td><td>400m (noise)</td><td>800m</td></tr>
<tr><td>Farmsteads (outside the project site)</td><td>400m (noise)</td><td>2 to 4km (can be less if outside the viewshed).</td></tr>
<tr><td>Private nature reserves/ game farms/ guest farms/ resorts</td><td>500m</td><td>2 to 5km (can be less if outside the viewshed).</td></tr>
</table></td><td>ECO to monitor
Site engineer/site manager</td><td>Design phase</td></tr>
<tr><td>Slopes steeper than 1:5 gradient to be avoided.</td><td>ECO to monitor
Site engineer/site manager</td><td>During site establishment
Monthly thereafter.</td></tr>
</table>

Mitigation Measure	Responsibility	Frequency
Cultural landscapes or valuable cultivated land, particularly along alluvial river terraces to be avoided.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Stream features, including 250m buffers, to be avoided.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Visual mitigation during construction		
Access and haul roads to use existing farm tracks as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Weekly
Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Measures to control wastes and litter to be included in the contract specification documents.	ECO to monitor Site engineer/site manager	During site establishment Weekly thereafter.
Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)		
~~Conduct a pre-disturbance inspection of any infrastructure that is to be positioned on sensitive geology. Sensitive specimens will need to be recorded and removed.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~During site establishment~~ ~~Monthly thereafter.~~
~~The employment of a palaeontologist during the construction phase, establishment of on-site curation facilities and identification of a repository for specimens.~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~During site establishment~~ ~~When required during construction.~~
~~During the construction phase a chance-finds procedure should be applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil~~	~~Environmental Control Officer should safeguard the fossils, preferably *in situ*, and alert the responsible heritage management authority (Heritage Western Cape for the~~	~~When required during construction~~

Mitigation Measure	Responsibility	Frequency
~~burrow assemblages be exposed by excavation or discovered within the development footprint.~~	~~Western Cape, SAHRA for the Northern Cape) so that appropriate action can be taken by a professional palaeontologist~~	
Once the final layout of the WEF and associated transmission line is determined, a pre-construction palaeontological study must be undertaken over areas underlain by the Lower Beaufort Group bedrocks. The study must be conducted by a qualified palaeontologist. The study would involve (a) recording of near-surface fossil material, including relevant geological data (e.g. stratigraphy, sedimentology, taphonomy), (b) judicious sampling of scientifically-valuable fossils as well as (c) making recommendations regarding further mitigation or conservation of specific fossil sites for the construction phase of the WEF and transmission line.	ECO to monitor Site engineer/site manager	Pre-construction
Best practice (not essential): The employment of a palaeontologist during the construction phase, establishment of on-site curation facilities and identification of a repository for specimens.	ECO to monitor Site engineer/site manager	Throughout construction
A walk-down of the final positions of the turbines and access road routes must be completed prior to construction by a qualified palaeontologist. The locations of construction camps and laydown yards must also be assessed as part of the walk-down report. The report must CLEARLY state which heritage resources are located within the Northern Cape and Western Cape Provinces to allow the relevant Heritage Resource Authority to provide comments (HWC in this case). The report must also clearly state the distance between each proposed project activity and identified resources via detailed descriptions, photographs and a map.	ECO to monitor Site engineer/site manager	Pre- construction phase
A buffer zone of 50 m must be maintained from all identified heritage resources. *Note: It is the specialist's view, that only fossil sites of high scientific / educational / cultural or other conservation significance that cannot be effectively mitigated through professional palaeontological recording and collection require buffer zones (Most recorded fossil finds are of low scientific /*	ECO to monitor Site engineer/site manager	Design phase Throughout construction

Mitigation Measure	Responsibility	Frequency
conservation value and can be effectively mitigated in the pre-construction or construction phase). **This caveat would need to be approved by the responsible Heritage Resource Authority (HRA), in this case HWC.*		
A Conservation Management Plan (CMP) must be developed for all heritage resources that are to be retained *in-situ*. The CMP must include and is not limited to details regarding on-going monitoring and access controls for affected interested and affected parties. This CMP must be submitted to the relevant Heritage Resources Authority for comment (in this case, HWC).	ECO to monitor Site engineer/site manager	Pre-construction Throughout construction
Turbine placements must avoid areas underlain by the Lower Beaufort Group rocks. Should this not be possible, a Watching Brief must be conducted during the construction phase of the project. This must include the on-site presence of a qualified palaeontologist who will monitor excavations for turbine foundations, access roads and underground cables within the Lower Beaufort Group rocks. A Watching Brief Report detailing the results of the monitoring must be submitted to the relevant Heritage Resource Authority (HRA) for comment.	ECO to monitor Site engineer/site manager	Pre-construction Throughout construction
A Chance Finds Procedure must be developed and implemented for the project, should fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint. This procedure must include standard protocol, steps and reporting structures to be followed should any fossil heritage be uncovered during any phase of development.	ECO to monitor Site engineer/site manager	Pre-construction Throughout construction
If any evidence of fossils or other categories of heritage resources are found during the proposed development, the relevant Heritage Resource Authority must be altered. A professional palaeontologist must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by the relevant Heritage Resource Authority (HWC in this case).	ECO to monitor Site engineer/site manager	Throughout construction

Mitigation Measure	Responsibility	Frequency
Archaeological material and rock engravings		
Conduct a final walk down of roads and check turbines positions for archaeological material.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
~~In the improbable event of archaeological material being found, this will need to be subject to sampling and removal from site under a work plan (Heritage Western Cape) or a permit (SAHRA)~~	~~ECO to monitor~~ ~~Site engineer/site manager~~	~~Throughout construction~~
A Chance Finds Procedure must be developed and implemented for the project. These procedures must include standard protocol, steps and reporting structures to be followed should any heritage be uncovered during any phase of development.	ECO to monitor Site engineer/site manager	Pre-construction Throughout construction
If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations) or other categories of heritage resources are found during the proposed development, the relevant Heritage Resources Authority must be alerted (HWC in this case). A professional archaeologist must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological significance, a Phase 2 rescue operation may be required subject to permits issued by the relevant Heritage Resource Authority (HWC in this case).	ECO to monitor Site engineer/site manager	Throughout construction
A buffer zone of 50 m must be maintained from all identified heritage resources.	ECO to monitor Site engineer/site manager	Design phase Throughout construction
Check dolerite clusters and flat dolerite rafts for rock engravings. Rock engravings must be assigned co-ordinates, photographed (so as to record detail) and moved out of harm's way, or the road adjusted to avoid them.	ECO to monitor Site engineer/site manager	Throughout construction
Colonial period heritage		
Re-use and sensitive repair of abandoned farm houses would make a positive contribution to heritage conservation. Refurbishment should be done under the advice of a heritage architect/consultant.	ECO to monitor Site engineer/site manager	Design phase

Mitigation Measure	Responsibility	Frequency
Graves		
In the event of human bones being found on site, an archaeologist must be informed immediately and the remains removed under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.	ECO to monitor Site engineer/site manager	Throughout construction
All identified grave yards must be mapped and co-ordinates given to the developer and the contractor. These areas must be avoided, as far a practical. The contractor is to ensure that the work force are aware of these areas, and buffers applied around them.	ECO to monitor Site engineer/site manager	Throughout construction
Employment and Business Creation Opportunities		
An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;	Developer/ site manager	Pre-construction and throughout construction
The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;	Developer/ site manager	Pre-construction and throughout construction
Before the construction phase commences the proponent should meet with representatives from the BWLM to establish the existence of a skills database for the area. If such as database	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
exists it should be made available to the contractors appointed for the construction phase;		
The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	Developer/ site manager	Pre-construction and throughout construction
Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;	Developer/ site manager	Pre-construction and throughout construction
The proponent should liaise with the BWLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;	Developer/ site manager	Pre-construction and throughout construction
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	Developer/ site manager	Pre-construction and throughout construction
The BWLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.	Developer/ site manager	Pre-construction and throughout construction
The proponent in consultation with the contractor should hold a workshop/s with local farmers and representatives from the BWLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved	Developer/ site manager	Pre-construction and throughout construction
The proponent in consultation with the contractor should investigate option of establishing a cell phone booster mast on the site.	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
impacts on family structures and social networks associated with the presence of construction workers		
An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area; The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;	Developer/ site manager	Pre-construction and throughout construction
The proponent should establish a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the BWLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;	Developer/ site manager	Pre-construction and throughout construction
The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;	Developer/ site manager	Pre-construction and throughout construction
The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;	Developer/ site manager	Pre-construction and throughout construction
The contractors should make the necessary arrangements to transport workers from Beaufort West, Graaff-Reinet and Richmond home over weekends. This will reduce the risk posed to local family structures and social networks in Murraysburg;	Developer/ site manager	Pre-construction and throughout construction
No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Developer/ site manager	Pre-construction and throughout construction
impacts on family structures, social networks and community services associated with the influx of job seekers		
The proponent should implement a “locals first” policy, specifically with regard to unskilled and low skilled opportunities;	Developer/ site manager	Pre-construction and throughout construction
The proponent should implement a policy that no employment will be available at the gate and or in Murraysburg (except for local residents).	Developer/ site manager	Pre-construction and throughout construction
risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction
The proponent should establish a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.	Developer/ site manager	Pre-construction and throughout construction
The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities.		
The Environmental Management Programme (EMP) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;	Developer/ site manager ECO to monitor	Pre-construction and throughout construction
The contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;	Developer/ site manager Safety officer	Pre-construction and throughout construction
The housing of construction workers on the site should be strictly limited to security personnel.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;	Developer/ site manager Safety officer	Pre-construction and throughout construction
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
The contractor should provide adequate firefighting equipment on-site;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;		
The contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The contractor should provide fire-fighting training to selected construction staff;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
No construction staff, with the exception of security staff, to be accommodated on site over night;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site		
The contractor must ensure that damage caused by construction related traffic to the gravel road between Murraysburg and Richmond, the Swaelkranz Road and the Witteklip Road and local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor. Experience for other renewable energy projects is that the maintenance for roads is the responsibility of the local district roads authority. In many instances the local district roads authority lack the resources to maintain the local road network. In addition, due to legal restrictions, it is not possible for the contractor to repair damage to public roads. This can result in damage to roads not being	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
repaired before the construction phase is completed. This is an issue that should be addressed with the local district roads authority prior to the commencement of the construction phase; As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods; Sections of the roads that are located adjacent to irrigated lands or farmsteads should be watered regular basis to reduce impact of dust;		
The contractor must ensure that all construction vehicles adhere to speed limits and vehicles used to transport sand and building materials must be fitted with tarpaulins or covers;	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly; Speed limits must be applied. Construction vehicles limit of 40 km/hr on site.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined.	Site engineer/ site manager Safety officer and ECO	Daily. Pre-construction and throughout construction
The Contractor should be required to collect waste along the road reserve on a daily basis.	Site engineer/ site manager ECO	Daily. Pre-construction and throughout construction
Waste generated during the construction phase should be transported to the registered landfill.	Site engineer/ site manager ECO	Weekly throughput construction
EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction
impact on farmland due to construction related activities		
The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of key specialist studies, including the soil and botanical study. In this regard areas of high potential agricultural soils should be avoided;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowners in the finalisation process and inputs provided should be implemented in the layout as best as possible;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions;	Site engineer/ site manager Developer to implement ECO	Weekly post construction
The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA;	Site engineer/ site manager Developer to implement ECO	Tender phase
The implementation of the Rehabilitation Programme should be monitored by the ECO;	Site engineer/ site manager Developer to implement ECO	Weekly
All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Daily

Mitigation Measure	Responsibility	Frequency
Disturbance footprints should be reduced to the minimum.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
General Construction Mitigation Measures		
Potable toilets must be supplied to the workforce in areas of activity. One toilet per 14 workers must be implemented. Females must have separate toilets. A licenced contractor must be appointed by the contractor to provide this facility, and ensure that wastes are correctly disposed of. Servicing must take place on a weekly basis, proof of which must be retained on site by the contractor.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly
Waste skips must be provided in areas of construction activity as well as within the lay down areas, along with waste bins. Wastes must be separated into the following categories: • General waste, compactable and non-compactable • Waste paper recycling • Scrap metal • Globes and fluorescent tubes • Rubber waste • Medical waste • Chemical waste • Hazardous waste	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly

Mitigation Measure	Responsibility	Frequency
Health and Safety		
Implementation of safety measures, work procedures and first aid must be implemented on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Workers should be thoroughly trained in using potentially dangerous equipment	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Contractors must ensure that all equipment is maintained in a safe operating condition.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
A safety officer must be appointed.	Developer to implement	Pre-construction
A record of health and safety incidents must be kept on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Any health and safety incidents must be reported to the project manager immediately.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction.
First aid facilities must be available on site at all times.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Workers have the right to refuse work in unsafe conditions.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Daily
The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Frequency
Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
An STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms should be approached with the necessary cultural sensitivity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction camp.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
No person is to enter the site without the necessary PPE.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Pre-construction, construction and operation activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Frequency
The workforce is to be provided with sufficient potable water and under no circumstances are they to use untreated water from the local watercourses for drinking.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise		
Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development sites.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
All construction vehicles and equipment are to be kept in good repair.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Portable acoustic shields should be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators).	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Blasting operations are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor and ECO should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Frequency
Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Construction activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Should any equipment, such as generators on-site, generating excessive noise, they should be fitted with appropriate noise abatement measures.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

6.2 Post Construction

- Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done and fencing in of the area shall be considered if livestock/faunal species specific to the area may subsequently have access to such an area.
- Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.
- Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.
- Specific areas must be designated for cement/concrete mixing/ batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.
- The construction camp must be kept clear of litter at all times.
- Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal.
- All remaining material including building rubble and waste are to be removed from the site.
- All areas disturbed should be managed to ensure efficient drainage.
- The area designated for the deposition of spoil material is to be levelled and shaped to ensure the efficient drainage of the site. Under no circumstances is general or hazardous waste to be disposed of at this site.

6.2.1 Infrastructure

- Disassemble all temporary infrastructure units and remove components from the working areas and contractors camp. This will include storage structures and containers, water storage container, power supply, workers accommodation, sewage systems
- Drain all potable chemical toilets, being careful not to spill the contents. Transfer the waste to an appropriate disposal site.
- Drain all waste water and sewage associated with temporary ablution facilities and transfer the waste to an appropriate disposal site to be identified by the contractor.
- Disassemble all fencing around the camp and either sell, suction or donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Do not leave any components, waste or infrastructure units within the working area and camp unless specifically required for the operation and maintenance phases and as agreed by the ECO

6.2.2 Contaminated Substrate and Pollution Control Structures

- Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas.
- Remove all plastic linings used for pollution control and transfer to an appropriate disposal site.
- Break up all concrete structures that have been created and remove concrete waste to an appropriate disposal site.

6.2.3 Waste

- Remove all remaining construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

- Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site. Remove all waste receptacles from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

7 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF Phase 1 is completed the project becomes operational. The operator of the WEF has the responsibility to ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately. The main impacts associated with the operation phase of the WEF relate to birds and bats.

During the operation and maintenance of the WEF (including the normal operation of the turbines themselves) a certain amount of disturbance results. An operational WEF will normally have various day to day activities occurring on site, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing.

These factors can all lead to birds avoiding the area for feeding or breeding, and effectively leading to habitat loss and a potential reduction in breeding success (Larsen & Madsen 2000; Percival 2005). Turbines can also be disruptive to bird flight paths, with some species altering their routes to avoid them (Dirksen *et al.* 1998, Tulp *et al.* 1999, Pettersson & Stalin 2003). While this reduces the chance of collisions it can also create a displacement or barrier effect, for example between roosting and feeding grounds and result in an increased energy expenditure and lower breeding success (Percival 2005). This could potentially occur for any waterbirds regularly utilising one of the larger dams on either side of the WEF site for foraging but roosting on the other side of the turbines (or vice versa).

Disturbance distances (the distance from wind farms up to which birds are absent or less abundant than expected) can vary between species and also within species with alternative habitat availability (Drewitt & Langston 2006). Some studies have recorded distances of 80 m, 100 m, 200 m and 300 m (Larsen & Madsen 2000, Shaffer & Buhl 2015) but distances of 600 m (Kruckenberg & Jaehne 2006) and up to 800 m have been recorded (Drewitt & Langston 2006).

Raptors are generally fairly tolerant of wind farms, and continue to use the area for foraging (Thelander *et al.* 2003, Madders & Whitfield 2006), so are not affected by displacement, which however increases their collision risk.

It is expected that some species potentially occurring on the WEF site will be susceptible to displacement, for example smaller passerines such as larks, coursers and large terrestrial red data species such as Karoo Korhaan and Ludwig's Bustard. The extent of the impact will be local and restricted to the WEF site. As some species may not return the duration is potentially long-term.

WEFs have the potential to impact bats directly through collisions and barotrauma resulting in mortality (Horn et al. 2008; Rollins et al. 2012), and indirectly through the modification of habitats (Kunz et al. 2007b). Direct impacts pose the greatest risk to bats and, in the context of the project, habitat loss and displacement should not pose a significant risk (unless a large roost in discovered on site and bats are reluctant to leave this roost if disturbed) because the project footprint (i.e. turbines, roads and infrastructure) is small relative to the area monitored.

The developer has the responsibility to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

7.1 Potential Operation Phase Impacts

The table below provides a summary of the potential impacts of the operation of the WEF, as assessed by specialists and amended in 2020.

Summary of Operation Phase Impacts

Environmental aspect	Impact	Without mitigation	With mitigation
Operation			
Terrestrial ecology (flora and fauna)	Alien plant invasion risk	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Low (-)
	Faunal impacts during operation	Medium (-)	Medium (-)
Birds	Disturbance and displacement	Medium (-)	Low (-)
	Electrocution	Medium (-)	Low (-)
	Power line collisions	High (-)	Medium (-)
	Wind turbine collisions	High (-)*	Medium (-)
Bats	Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity	High (-)	Low (-)
	Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.	High (-)*	Low (-)
Socio-economic	Creation of employment and business opportunities	Low (+)	Low (+)
	Establishment of Community Trust	Medium (+)	High (+)
	Promotion of renewable energy projects	Medium (+)	Medium (+)
	Visual impact and impact on sense of place	High (-)	Medium (-)
	Impact on tourism	Medium (-)	Low (-)
Visual	Wind turbines	High (-)	Medium (-)
Noise	Operational noise	Very low[4] (-)	(No rating)

* These impacts represent the revised impacts as assessed during the 2020 Amendment Process

[4] Rated as very low significance for the 175 MW layout which more closely resembles the current layout of 147MW than the 245 MW layout which was rated as low significance.

Table 7:1 Operational Phase Mitigation Measures

Mitigation Measure	Responsibility	Frequency
Ecology		
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. The recovery of the indigenous shrub/grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.		
No unauthorized persons should be allowed onto the site. Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises. If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
Birds		
Post-construction/operational monitoring must be done in line with the latest Best Practice Guidelines[5] and must be conducted as soon as the turbines become operational, any mortalities must be reported to BirdLife SA. As a minimum this monitoring programme must: • Continue for the first two years of operations, longer if a need is identified; • Record the numbers /densities of birds regularly present or resident within and around the operational WEF; • Document patterns of bird movements in the vicinity of the operational WEF; • Compare these data with baseline figures and hence quantify the impacts of displacement and/or collision mortality; and • Carcass surveying at the WEF for fatalities should also be done for a minimum of two years after construction and should be repeated again at year five and every five years thereafter.	Site engineer/ site manager Developer to implement ECO	Throughout operation. Monthly checks
Post-construction monitoring is to include manual searching of the site for carcasses to identify potentially problematic WTGs and critical to inform an effective curtailment plan.	Site engineer/ site manager ECO	Throughout operation. Monthly checks
~~Turbines must not be constructed within any of the nest site buffers.~~ ~~The hierarchy of sensitivity scores presented in the Bird Sensitivity Map, should be considered, with preferential turbine placement in areas of Low Sensitivity, and decreasing preference through to High Sensitivity areas. While not classified as no-go areas,~~	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

[5] At the time of writing, the current guidelines are as follows: Jenkins, A.R. van Rooyen C.S., Smallie, J.J., Harrison J.A., Diamond M., Smit-Robinson H.A., and Ralston-Paton S. 2015. B*est Practice Guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa* (Third Edition, 2015). BirdLife South Africa, Johannesburg, South Africa.

Mitigation Measure	Responsibility	Frequency
~~it is recommended that placement of turbines in grid cells with a High CCSS be avoided. Where two or more sensitivity areas overlap, the layer with the higher sensitivity designation should take preference.~~ ~~Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines.~~ ~~Develop and implement a 12 to 24 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. This program should be enhanced to include sampling during dusk and dawn.~~ ~~Frequent and regular review of operational phase monitoring data (activity and carcass) and results by the bird specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development.~~ ~~The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigations to be implemented.~~ <u>Results of post-construction bird monitoring must be used to design mitigation measures where necessary.</u> As a starting point for the review of possible mitigations, the following may need to be considered: • Assess the suitability of using deterrent devices (e.g. DT Bird and		

Mitigation Measure	Responsibility	Frequency
ultrasonic/radar/electromagnetic deterrents for bats) to reduce collision risk. • Identify options to modify turbine operation to reduce collision risk.		
Nests of Verreaux's Eagle must be monitored for breeding activity throughout the lifespan of the facility as per the Verreaux's Eagle guidelines.	ECO to monitor Site engineer/site manager	Throughout operation
Mitigation measures (e.g. curtailment or shut-down-on-demand) must be implemented on any turbines responsible for the fatalities of two or more Verreaux's Eagle.	Site engineer/ site manager ECO	Throughout operation
Any overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by the avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and the avifaunal specialist must be contacted for further instruction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Animal carcasses encountered on the facility must be recorded and reported to the ECO for removal during the operation to reduce the chances of attracting avifauna into the project site.	ECO	Throughout operation
Bats		
~~Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO and Safety Officer~~	~~Throughout operation. monthly checks~~

Mitigation Measure	Responsibility	Frequency
~~constructed within areas of Medium-High or High bat sensitivity.~~ ~~Clearing of natural and agricultural areas be kept to a minimum.~~ ~~Minimize impacts to wetlands and water resources by following all applicable provisions of the National Water Act~~ ~~Gaps of at least 3 turbine blade lengths are left open between turbines, from blade tip to blade tip.~~ ~~Keep road, turbine and sub-station lighting to minimum.~~ ~~Minimize use of high intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights.~~ ~~With the exception of red aviation safety lights on lights on the turbines and meteorological masts, lights should be hooded downward and directed to minimize horizontal and skyward illumination.~~ ~~All internal turbine nacelle and tower lighting should be extinguished when unoccupied.~~		
~~Turbine engineer's work with bat specialists to build in the necessary turbine adaptions needed for erecting bat detectors or deterrent devices on the turbines in the design phase, so there are no unexpected surprises or concerns after the turbines are built.~~ ~~For areas of Low-Medium and Medium Sensitivity~~ ~~With the exception of when temperatures are below 12°C.~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO and Safety Officer~~	~~Throughout operation. monthly checks~~
~~An initial cut-in speed of 5.25 m/s (approximately 50% of bat activity occurs below this wind speed) is recommended as follows:~~ ~~Not in winter.~~ ~~20h00 to 04h00 in Summer~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO and Safety Officer~~	~~Throughout operation. monthly checks~~

Mitigation Measure	Responsibility	Frequency
~~18h30 to 04h30 in Autumn~~ ~~19h00 to 04h00 in Spring~~		
~~Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible. This data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO~~	~~Throughout operation. monthly checks~~
~~Construction phase monitoring on at least one met mast in each phase commences as soon as Phase 1 construction of any sort starts. Any additional mitigation measures that arise from the monitoring and from lessons learned from Phase 1 operational monitoring, get implemented in Phase 2.~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO~~	~~Throughout operation. monthly checks~~
Acoustic bat monitoring that commenced before and during should continue into operation.	ECO to monitor Site engineer/site manager	Throughout operation
Perform operational bat monitoring according to the latest SABAA guidelines	ECO to monitor Site engineer/site manager	Throughout operation
Adaptively manage bat fatalities by consulting the latest SABAA guidelines	Developer to implement	Throughout operation
~~Pre-construction and operational monitoring bat data to feed into the SANBI bird and bat toolkit. Monthly carcass searching reports to be submitted to the SABAAP.~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO~~	~~Throughout operation. monthly checks~~
~~As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.~~	~~Site engineer/ site manager~~ ~~Developer to implement~~ ~~ECO~~	~~Throughout operation. monthly checks~~

Mitigation Measure	Responsibility	Frequency
Implement curtailment as outlined below: The importance of mitigating bat fatalities cannot be over-emphasised. Whilst acoustic deterrents are showing positive results for lowering bat fatalities at WEFs in some parts of the world, in South Africa, data are very limited, and deterrent devices are not readily available for installation. Therefore, curtailment is still the most effective and available bat fatality minimization strategy in this country. For the Umsinde WEF, IWS recommends the following strategy: 1) All parts of all turbines (including the full rotor swept area) are not to encroach into any High and/or Medium-High sensitive areas. **The amended layout meets this requirement.** 2) Operational bat monitoring according to Aronson *et al.* 2020 (or later editions relevant at the time of the monitoring) must be implemented as soon as the wind turbines become operational. The quality of the operational monitoring and data analysis are to be conducted to a high standard so that there is confidence in the data and the fatality estimate results. 3) Where turbines encroach into **Medium sensitive areas**, implement curtailment of all these turbines as soon as each starts operating. Curtailment will require implementation of an initial cut-in speed of 4.5m/s between 1 September and 31 May, when temperatures are 12°C or higher, during the following seasonal time periods:	Site engineer/ site manager Developer to implement	Throughout operation

Mitigation Measure	Responsibility	Frequency
a. Autumn: 18h30 to 04h00 b. Spring: 19h00 to 04h00 c. Summer: 20h00 to 04h00 4) If the bat fatality threshold (as determined according to the latest relevant SABAA guidelines *viz.* MacEwan *et al.* 2018 or later editions relevant at the time of the monitoring) is exceeded, further adaptive management and mitigation (possibly including greater curtailment) must be implemented (refer to Aronson *et al.* 2018 or later editions). 5) If the quality of the operational monitoring and data analysis is not conducted according to Aronson *et al.* 2020 (or later editions relevant at the time of the monitoring), the above-recommended curtailment strategy should be implemented at all turbines at the WEF. 6) The specialist conducting the Year 1 and Year 2 operational monitoring should provide recommendations for adaptive management of the above strategy after the second year of operational monitoring. Allowance should be made in the financial provision for such adaptive management and mitigation.		
Best practice (not essential): Forward all (live and fatality) bat monitoring data to SANBI's database or the database recommended by SABAA to expand scientific knowledge base for more informed decision making and mitigation.	Specialist	Throughout operation
Best practice (not essential): Submit quarterly carcass searching reports to SABAAP and quarterly progress	Specialist	Throughout operation

Mitigation Measure	Responsibility	Frequency
and annual operational bat monitoring reports to SABAAP, EWT and DEFF		
Social		
The enhancement measures listed in Construction phase Section, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; The proponent, in consultation with the BWLM, should investigate the options for the establishment of a Community Development Trust	Developer to implement	Throughout operation. monthly checks
The BWLM and members from the local Murraysburg community should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the BWLM that should be consulted include the Municipal Managers Office, IDP and LED Manager. Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community; Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.	Developer to implement	Throughout operation. monthly checks
The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of	Developer to implement	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
South African's employed during the operational phase of the project.		

8 ALIEN INVASIVE MANAGEMENT PLAN

8.1 Purpose of the Alien Invasive Management Plan

The purpose of the Umsinde Emoyeni WEF Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Umsinde Emoyeni Wind Energy Facility. The broad objectives of the plan includes the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

8.2 Problem Outline

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

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a land user must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

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

8.2.1 Vulnerable Ecosystems and Habitats

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.

- Construction camps and lay-down areas which are cleared or are active for an extended period

8.2.1.1 Wetlands, drainage lines and other mesic areas

There are a relatively large number of drainage lines at the site as well as a number of artificial wetlands. Disturbance within these areas often results in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more than the surrounding landscape.

8.2.1.2 Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance created during construction which promoted the germination and establishment of alien plant species.

8.2.1.3 Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials

8.3 General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

8.4 Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website: https://www.environment.gov.za/projectsprogrammes/wfw/resources#mannuals

8.5 Use of Herbicide for Alien Control

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

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

9 ALIEN PLANT MANAGEMENT PLAN

9.1 Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Construction Phase Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as	Weekly

building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

9.1.1 Monitoring Actions - Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Pre-construction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

9.2 Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Operational Phase Action	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

9.2.1 Monitoring Actions - Operational Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

9.3 Decommissioning Phase Activities

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Decommissioning Phase Action	Frequency
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required
Maintain alien plant monitoring and removal programme for 3 years after rehabilitation.	Biannually

9.3.1 Monitoring Actions - Decommissioning Phase

The following monitoring and evaluation actions should take place during the decommissioning phase of the development

Monitoring Action	Indicator	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually for 3 years

Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

10 PLANT RESCUE AND PROTECTION PLAN

10.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development on listed and protected plant species and their habitats. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

The objective of reusing plants on the project area is to prevent the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.

Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.

10.2 Effect of removing individual species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

10.3 Plant Rescue and Protection

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

10.4 Time of Planting

- All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.
- Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

10.5 Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the Re-vegetation and Habitat rehabilitation Plan.

11 RE-VEGETATION AND HABITAT REHABILITATION PLAN

The Revegetation and Habitat Rehabilitation Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPs mentioned.

The objective of the plan is therefore to provide:

- Protocols for the removal, temporary storage and replanting of plant species of conservation concern Protocols for the rehabilitation of vegetative cover across the project area
- Tools for planning the rehabilitation work and responding to unforeseen events Guidelines on implementation and post-implementation tasks Criteria for evaluating rehabilitation success
- A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts

The objective of rehabilitation and revegetation of the development area is:

- Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- Preserving or re-creating the structural integrity of natural plant communities. Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.
- Improving the ecosystem function of natural landscapes and their associated vegetation.
- Successful rehabilitation can only be achieved with: »A long-term commitment »Practical, adaptive management »Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

- What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
- A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
- Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.
- The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

11.1 Map and create management areas

The entire project area must be mapped and divided into management areas indicating:

- Current land cover
    - Roads and residential
    - Areas with IAPs, subdivided further in sparse or dense infestations where applicable
    - Transformed areas
    - Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

- what will happen there
- what needs to be mitigated – including storm water- and erosion management
- which management units need priority intervention/mitigation
- how will this mitigation / intervention be done (method statements) including schedule of work
- realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation
- approximate timeframes
- monitoring protocol to evaluate success or failures of interventions
    - establish permanently marked transects and monitor with fixed-point photography who will be responsible for doing what how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

11.2 Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

- Stabilisation of soils
- Stabilisation of riparian areas
- Storm water reduction through management and wetland integrity
- Clearing of IAPs
    - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
- Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely

11.3 Remove or ameliorate the cause of degradation

This will include:

- Physical rehabilitation of topsoil where it has been removed.
- Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
- Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils
- Stabilisation of topsoils and prevention of erosion – refer to the Erosion management pan
- Removal of all invasive vegetation – refer to the Alien Invasive Management Plan
    - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers

11.4 Initial Revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

11.5 Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable

species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

- First restore drainage line morphology following the guidelines of the Erosion Management Plan – without that ecological recovery cannot be initiated
- Determine if natural seed sources may be present further upstream
- If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum)
- Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

11.6 Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
- Associated nature and stability of surface soils
    - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- Re-emergence of IAPs
    - If noted, remedial action must be taken immediately according to Working for Water specifications
- Nature and dynamics of riparian zones
    - Stability of riparian vegetation

- Any form of bank erosion, slumping or undercutting
- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

11.7 Timeframes and duration

- Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
- The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).
- If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).
- Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
- Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
- Succession of natural plant species should be encouraged
- Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

12 OPEN SPACE MANAGEMENT PLAN

The objective of open space management is to restore, enhance and rehabilitate open spaces, improve climate change adaptations through the minimisation of biodiversity loss, and mitigate against environmental degradation. Management actions consider open spaces and natural areas as well as community perceptions of these.

In the context of the proposed grid connections and substations the primary purpose of the open plan management plan is therefore to:

- Minimise visual impact on the character of the area; and
- Maintain biodiversity within the area to ensure that no long-term negative impacts occur on the local environment.

The proposed grid connection connections and associated infrastructure have the potential to impact negatively on the character of the area, as identified in the Visual Impact Assessment conducted during the EIA phase. The following actions must be implemented to minimise this visual impact:

- Grid connection route to avoid visually sensitive peaks, major ridgelines, scarp edges and slopes steeper than 1:5 gradient
- Substation to be sited in unobtrusive low-lying areas, away from roads and habitations, and screened by berms and/or tree-planting where feasible.
- Operations and maintenance buildings and parking areas to be located in an unobtrusive area and consolidated to avoid sprawl of buildings in the open landscape.
- Access roads to be in sympathy with the contours, avoid steep 1:5 slopes and drainage courses, and kept as narrow as possible.

- Access and haul roads to use existing farm tracks as far as possible.
- Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.
- Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential.
- Measures to control wastes and litter to be included in the contract specification documents.
- Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.

In order to maintain biodiversity the Alien Invasive, Plant Rescue and Protection and Re-vegetation and Habitat Management Plans must be adhered to.

In addition the following actions should implemented by the Contractor and Project Company:

- Promote environmental awareness in all employees and sub-contractors and create an understanding of the environmental sensitivities of the project site;
- No waste, including organic matter may be disposed of anywhere on site, except in provided bins placed at convenient locations, especially during the construction period. Disciplinary actions should be taken against littering.
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled
- All visitors and contractors should be required to sign-in
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited

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

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

12.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse of extensive livestock production. Extensive livestock grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management. While the majority of these are beyond the scope of the current plan, the following basic principles should be adhered to:

- A grazing management plan for the site should be developed in cooperation with Agricultural Extension services.
- The stocking rate applied should be within the recommended limits as identified by the Department of Agriculture.
- Livestock should be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.
- Precautions should be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

13 TRAFFIC MANAGEMENT PLAN

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation and decommissioning phases of the proposed projects. Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.

Actions to be implemented by the Contractor and Project Company:

- Site-specific traffic plan to be developed and implemented during the detailed design phase prior to construction;
- Limit use of private cars by arranging mini bus transport service for workers;
- Monitor for overloading of vehicles;
- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;
- All vehicles must be roadworthy and serviced regularly;
- Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- Require all drivers to abide by standard road and safety procedures on site;
- When travelling on public roads all speed limits and rules of the road must be adhered to; and
- Limit dust generation by applying dust suppressants and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.

Monitoring actions to be conducted by the ECO

- Maintain incidents/complaints register for community complaints;
- Monitor dust generation and implementation of management actions detailed above.

14 TRANSPORTATION MANAGEMENT PLAN

The Transportation Management Plan aims to ensure the safe transportation of all components required for the construction of the proposed projects to the construction site. This includes the, turbines, substation transformers, electrical cables and pylon structures.

The following actions should be implemented by the developer and Contractor:

- Apply for all relevant permits for abnormal loads and route clearances with the relevant authorities prior to construction;
- Appoint a qualified specialist to conduct a detailed site-specific Transport Risk Assessment during the detailed design phase and prior to construction;
- Determine the pre-construction condition of the road immediately prior to construction by carrying out a condition assessment or from recent pavement management system condition assessments if available from the Provincial Authorities;
- Public notices regarding any planned abnormal load transports must be placed at the construction site to inform affected parties;
- Abnormal loads must conform with legal maximum dimensions, and vehicles carrying abnormal loads must display sufficient signage;
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

The following monitoring activities should be carried out by the ECO:

- Conduct site audits and report non-compliance with the above-mentioned conditions

15 STORMWATER MANAGEMENT PLAN

The objective of the storm water management plan (SWMP) is to prevent increased soil erosion, to contain any contaminated run-off and to avoid water logging and pollution. The Erosion Management Plan (see below) must therefore be seen in conjunction with the SWMP. Actions are listed that will ensure that storm water is channelled in a controlled manner from roads and substations towards natural drainage lines, without impeded natural surface flows.

- Develop and implement a site-specific storm water management plan during the detailed design phase of the projects and prior to construction;
- In the detailed design phase of the project minimise any water crossings and utilise existing roads wherever possible;
- Enforce 32 m construction buffers of all rivers, streams and waterbodies;
- Should new roads be required to cross any banks or channels these must be secured with erosion protection (ie. gabions etc);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (ie. construct gravel roads and not asphalt roads wherever possible);
- Roads in steep areas must be equipped with side drainages and culverts that channel the run-off to natural drainage lines without gaining velocity and causing erosion;
- Construction camps and temporary ablution facilities must be located beyond the 1:100 year floodline;
- Stockpiles must be located on flat areas and protected from erosion;
- The substation site design must include side water outlets and an adequate slope to allow storm water run-off from the paved areas;
- Prevent surface run-off from areas of potential contamination

16 EROSION MANAGEMENT PLAN

16.1 Purpose

The purpose of the erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

16.2 Scope and Limitations

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

16.3 Background

16.3.1 Types of Erosion

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

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet Erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill Erosion

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

Gully Erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion.

Wind Erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands.

16.3.2 Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles.

Soil erodibility

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

Length and Steepness of Slope

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

Soil Surface Cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

16.3.3Erosion and Sediment Control Principles

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

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

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

16.3.4On-Site Erosion Management

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

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

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation

should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

16.4 Concentration of flows into downstream areas

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

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

16.5 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will elad to a significant increase in volume and velocity of flow generated from these areas during large rainfall events.

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

16.5.1 Diversion of Flows

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

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut

areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.
- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

16.6 Monitoring Requirements

16.6.1 Construction Phase

The following monitoring actions should be implemented during the construction phase of the development

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

16.6.2 Operational Phase

The following monitoring actions should be implemented during the operational phase of the development:

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

17 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires.

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

- Lightning strikes
- The railway line which runs through the facility
- Personnel within the facility
- Infrastructure such as transmission lines

17.1.1 Firebreaks

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, a strip of vegetation 5 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However if alien species colonise these areas, more regular clearing should be implemented.

18 FUEL STORAGE MEASURES

18.1 Storage Tanks

The storage tanks will be within contained areas to prevent spills contaminating soil and water, and with a design to capture and contain a volume of spill of at least 110% of the volume of stored fuel. These containers can be built in concrete and painted with anti-corrosive paint. The floor of the container must be inclined to permit the collection of the spilled liquids.

The storage tanks must also have a cover protection on top, prepared for drainage and collection of runoff.

18.2 GENERAL PROCEDURES

- Transport routes for the transport of fuel will be clearly indicated;
- Pollution control equipment (spill and leak cleaning kits) must be readily available;
- Ensure personnel training, including: measures to prevent fuel spills, to treat/clean fuel spills, how to react on spill of flammable liquids on clothing and in the inhalation of vapours, leaks simulations; fuel vapour recovery processes, etc. Keep records of all training;
- Maintain the premises and equipment in a clean and tidy state;
- Regularly clean outdoor areas with a broom;
- Wastewater from outside areas must be directed to the contaminated water drainage system, and not enter the storm water system;

- Used oils (waste oil) will be collected, re-used, stored and disposed of in line with disposal procedures for hazardous wastes;
- Ensure the proper management of other hazardous wastes (contaminated soils, used spilling kits, waste lube, etc).

FILLING OPERATIONS

- Isolate the area by cones and a rope;
- Prohibit refuelling operations during tank filling operations;
- Avoiding having people who are not involved in the operation within a 10 metre radius;
- Prohibit smoking and the use of mobile telephones or any other ignition sources during tank filling operations or vehicle refuelling, within a 3 metre radius;
- Use a tight-fill cap to completely seal off the connections between the tubing and the truck's and station's tanks;
- Engines must be turned off during refuelling;
- Prevent overflowing and spilling situations when the storage tanks are being filled (verify filling sensors and be aware of overflow alarms).

Preventing Accidents with fuel mixtures

- Establish a procedure to deal with the potential occurrence of these situations, such as:
- The chemicals and reaction mechanisms associated with the substances mixed or blended must be well understood and documented
- Chemical and process hazards must be understood and addressed and the facilities should ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees should understand the chemical and process hazards
- Facilities should establish a system for Standard Operating Procedures and ensure that they are understood and followed
- Display clear and informative messages for users of the station, as to how to deal with this situation;
- Prepare a procedure to suitably dispose of wastes recovered from the batches of fuel mixture.

Spill Kits

- Emergency spill kits of absorbent material (e.g. sand) must be provided and stored next to the higher risk sites, and must be easily-accessible, ideally outside, in order to allow an immediate response when a spill occurs. This will be clearly labelled and ready for use.
- Drums for the storage of contaminated material must be provided.
- An accurate drawing of the local drainage system shall be posted next to the spill kit.

Closure Phase

- During the closure phase, there may be loss of product into the soil, as a result of a deliberate or accidental release during closure and removal of tanks and tubing. In addition, this risk may arise outside of the facility site, if the tanks and/or tubing are not properly disposed of.
- In the closure phase, it is important to remove all tanks and pipes. A risk may arise if the tanks are left on site with residual products. As the integrity of the equipment will no longer be ensured or monitored.
- During closure, it must be ensured that facilities do not present a risk to the environment, health or safety. Measures must be taken to ensure that the closure does not result in an unacceptable risk, including:

- Any and all waste products will be removed from the tanks. Care will be taken to ensure that no product is lost into the soil. Tank closure must be carried out safely, with the removal of explosive vapours, for example by filling the tanks with water or inert gases. All tanks will be safe prior to their removal from the ground. Similar methods will be employed prior to the removal of the pipes.
- Water used in this process will be contaminated with residual product, and thus a water contamination risk may arise if the contaminated water is not disposed of in a way which is appropriate for hydrocarbon contamination. This would normally imply the removal to a suitable waste handling facility.
- According to best environmental practices, the tanks, tubing and distributors will be disposed of. However, if the tanks remain in situ, it will be ensured that the procedure is safe. After making the tanks inert and safe, they will be filled in with sand, concrete, inert mud or hydrophobic foam.
- The tanks and associated tubing which are no longer considered appropriate or safe for fuel storage will not be used for storage of other hydrocarbons, without first ensuring their integrity.
- The oil/water separators will be removed for disposal, off the facility site. Otherwise they will be filled in a similar way to the tanks. Regardless of the fate of the oil/water separator, all liquid and mud waste will be removed (off the facility site) and all the inlets and outlets will be sealed.
- Whatever drainage system left behind will be modified to ensure that it does not serve as a path for pollutants to reach groundwater or other waters.
- If the deactivation is temporary, product can be left in the tanks. In this case, all monitoring procedures will be carried out as if the facility were in operation. If for any reason the monitoring cannot carry on, the tanks will be emptied and made inert.
- Personnel involved in the closure of a filling and fuel station will be aware and respect obligations with regards to waste disposal, in line with the best practices described above.

Environmental Aspect	**Action or Measure**
Prevent accidental spills from entering the stormwater drainage system	Provide cleaning equipment conceived specifically to deal with minor spills as may occur at the station. Place a clearly-identified spill kit in a visible location for each fuelling line.
	Develop a step-by-step guide to use of the spill kit.
	Develop an evacuation plan and/or response procedures for emergencies involving large fuel spills.
	Train the whole team in the emergency response procedures. Make sure that all staff knows where the emergency equipment is to be found and is acquainted with its maintenance.
	Label all of the stormwater drains on site in the proximity of the facilities as “Clean Water Only”.
	Inspect the fuel distribution area in order to confirm that rainwater drained or emptied from the roof doesn’t enter the areas marked out.
	Check whether the embankment around the fuel distribution area is in good condition and has the capacity to contain a fuel leak in the event of an emergency.

Environmental Aspect	Action or Measure
Minimise the risks of environmental contamination and from issues of workers' health and safety	Provide training to the staff regarding the disposal of material contaminated with fuel, such as absorbent material from the spill kit, soaked in fuel.
	Ensure that the product safety cards for all fuels and oils are up-to-date and accessible at all times.
Minimise the risks of fuel leaks as may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the spill containment sumps installed at the tank's discharge nozzle.
	Check if there is fuel, from a possible leak, in the all tanks containment sumps, installed on the manhole to the storage tanks. In the event of suspected leakage, report it immediately.
	Check if there is fuel or lube, from a possible leak in the containment sumps installed under the tanks.
Minimise the risks of fuel leaks as this may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the chambers of the containment sumps installed under the pumps
Minimise the risks of harmful emissions to the atmosphere and the loss of fuel	Check that lids, flanges and connections are closed.
	Confirm that the ventilation conduits are not blocked.
	Supervise the fuel deliveries.
Minimise the risks of water pollution	Carry out an Oil-Water Separator inspection to ensure effective treatment.
Integrity control	Adequate maintenance and calibration of the monitoring equipment

19 DECOMMISSIONING PHASE

Should the WEF be decommissioned a decommissioning plan must be produced. The plan must include details on the decommissioning and dismantling of the WEF, taking in consideration the potential environmental impact associated with it. Environmental monitoring plans must be produced so ensure no pollution occurs during this phase. The plan must include the steps that will be taken to rehabilitate the area after the WEF is dismantled, as well as recycling options of the equipment and structures.

20 CONCLUSION

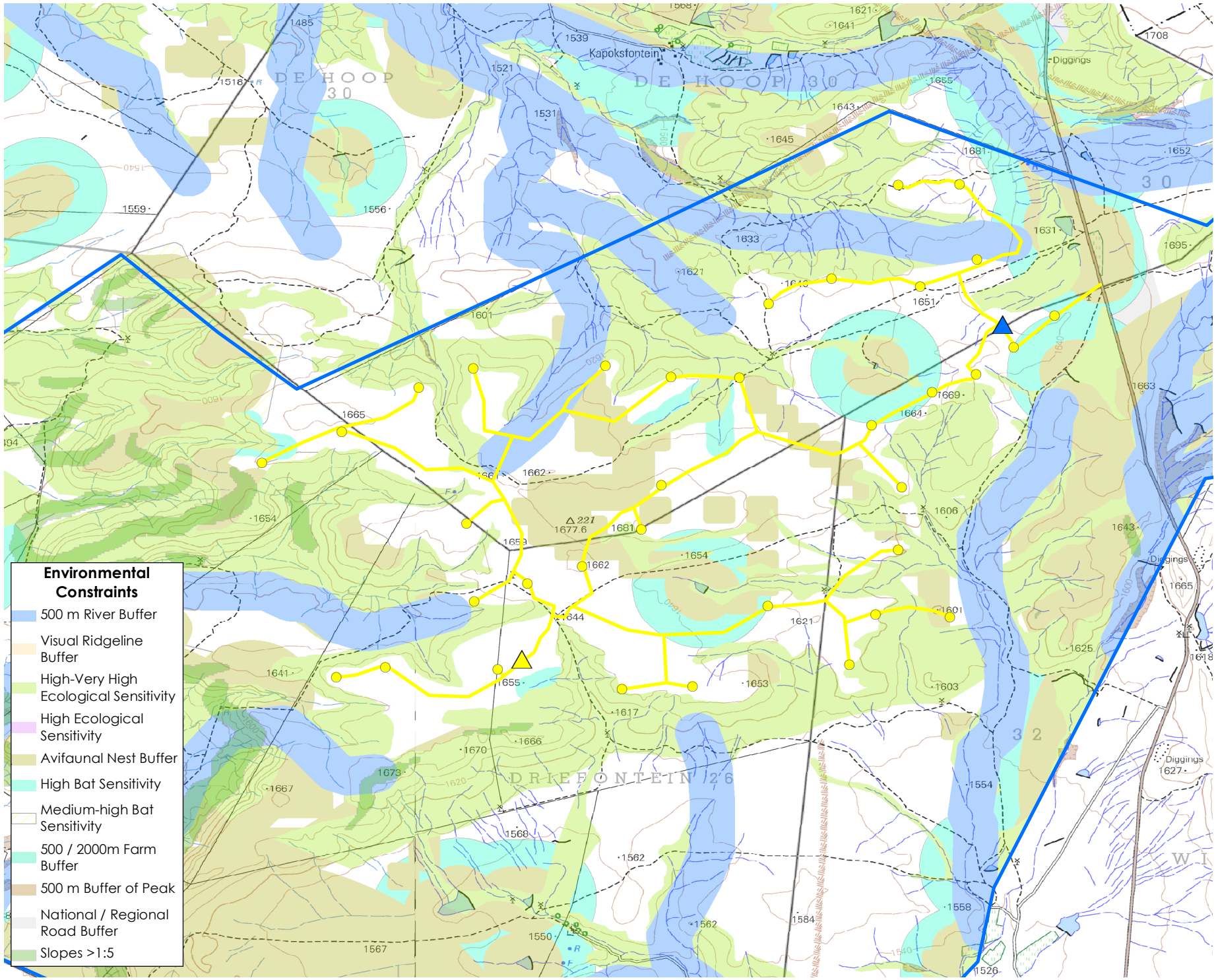
In terms of the National Environmental Management Act 107 of 1998 everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.

Furthermore, in terms of the 'Act', the cost to repair any environmental damage shall be borne by the person responsible for the damage.

It is therefore imperative that the management plan is successfully implemented, as a failure to comply could have legal implications.

The environmental impacts on the site will not be significant if the construction management is well implemented, and a set of operational guidelines are developed by the long term site management body.

Appendix 1: Environmental Constraints Map



Legend

Proposed Umsinde Infrastructure

- Turbines
- Proposed Laydown Yard
- Proposed Substation
- Roads
- Site Boundary

1:55 000

0 0,25 0,5 1 1,5 km

ZUTARI
IMPACT. ENGINEERED.

Umsinde Emoyeni Wind Energy Facilities

Environmental Constraints