VOLUME I

ENVIRONMENTAL MANAGEMENT PROGRAMME

for the

HARTEBEESTHOEK WEST WIND ENERGY FACILITY, NORTHERN AND EASTERN CAPE PROVINCES

On behalf of

HARTEBEESTHOEK WIND POWER (PTY) LTD

January 2023

DFFE REFERENCE: 14/12/16/3/3/2/1028/2 and 14/12/16/3/3/2/1028/2/AM3

DRAFT FOR PUBLIC COMMENT

VERSION 2.0

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QUALITY MANAGEMENT SYSTEM

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Version Number	Version 1.0	Version 1-1	Version 2-0
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Arcus Review and Approval	Ashlin Bodasing	-	
Signature		-	
ERM Review and Approval	-	18 January 2023	
Signature	-		

DEVELOPMENT DETAILS

DFFE EMPr Reference:	**To be Confirmed**
DFFE Reference:	14/12/16/3/3/2/1028/2 and 14/12/16/3/3/2/1028/2/AM3
Arcus Reference:	3329 Hartebeesthoek West WEF
Title:	Environmental Management Programme for the Hartebeesthoek West Wind Energy Facility, Northern and Eastern Cape Provinces
EAP:	Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2019 Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2023
Consultant:	Aneesah Alwie - Arcus Consultancy Services South Africa (Pty) Ltd, 2019 Aneesah Alwie - Arcus Consultancy Services South Africa (Pty) Ltd, 2023
Project Developer (Applicant):	Hartebeesthoek Wind Power (Pty) Ltd
Report Status:	Version 2.0 – Submission in Compliance with Conditions 17, 18, 19 and 20 of the Environmental Authorisation

PUBLIC PARTICIPATION DETAILS

This Environmental Management Programme (EMPr) has been updated based on the relevant conditions in the Environmental Authorisation (EA) and final design layout of the development.

Invitation to Comment: Members of the public, local communities, and stakeholders are invited to comment on this final EMPr which is available for public review and comment at the following locations.

Location	Physical Address
Hard Copy / CD Copy Location	
Noupoort Library	4 Shaw Street, Noupoort, 5950
Electronic Copy Locations	
Arcus Website	https://arcusconsulting.co.za/projects/
Electronic Transfer	I&APs can request for copies to be shared via a One Drive folder.
Comment Submission	
Contact Person	Ashlin Bodasing
Company	Arcus Consultancy Services South Africa (Pty) Ltd
Via Post	240 Main Road, 1st Floor Great Westerford, Rondebosch, 7700
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Via E-mail	projects@arcusconsulting.co.za
Via Online Portal	https://hbh-wef.aidaform.com/stakeholder-registration

Following the 30-day public consultation period, the Final EMPr including the Final Site Layout, will be submitted to the Department of Forestry, Fisheries and the Environment for approval prior to commencement of any activity.

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 (EMPr): The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr 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 EMPr 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 EMPr.

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 EMPr (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 EMPr.

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

EDF Renewables (Pty) Ltd (previously InnoWind) ('EDF'), through the Specialist Purpose Vehicle (SPV) Phezukomoya Wind Power (Pty) Ltd received environmental authorisation (EA) for the development of a 275 MW Wind Energy Facility (WEF), located near the town of Noupoort in the Northern Cape Province, with parts of the proposed facility traversing the Eastern Cape Province (Figure 1). Subsequent to the issue of EA in 2018, an application was submitted to the Department of Forestry, Fisheries and the Environment (DFFE) to split the 275 MW facility in two, namely Phezukomoya WEF and Hartebeesthoek West ('HBH West') WEF.

The Hartebeesthoek West WEF has been registered as a Strategic Integrated Project (SIP). This EMPr, for the Hartebeesthoek West WEF ('the development') represents the requested update to the previous EMPr submitted with the Final Amendment Report (Arcus, 2019 and 2021), including any new mitigation measures that were incorporated in the specialist's assessments (Original Reports, 2016; Amendment Reports, 2019; and Specialist Assessments based on the Conditions of the EA, 2023). The EMPr outlines measures to be implemented in order to minimise adverse environmental degradation associated with construction of the authorised 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 life cycle of the development, i.e., from Design phase until after Decommissioning phase.

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

1.1 Details of the Developer and the Environmental Assessment Practitioner

Details of the Developer (Applicant)	
Project Applicant	Hartebeesthoek Wind Power (Pty) Ltd
Company Registration	2019/070085/07
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Environmental Assessment Practitioner	
EAP	Ashlin Bodasing
Organisation	Arcus Consultancy Services South Africa (Pty) Ltd
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1.2 Purpose and Aims of this Document

An Environmental Management Programme (EMPr) for the proposed development is required in terms of the Appendix 4 of the National Environmental Management Act, 1998 (Act 107 of 1998), EIA Regulations of 2014 (GNR 326), as amended.

As per the Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning (DEA&DP) Guideline for Environmental Management Plans (Lochner 2005), the over-arching objectives of an EMPr is (1) to ensure compliance with regulatory authority stipulations and guidelines, (2) to ensure sufficient allocation of resources on the project budget, (3) to verify environmental performance through information on impacts as they occur, (4) to respond to changes in project implementation not considered in the EIA, (5) to respond to unforeseen events and (6) to provide feedback for continual improvement in environmental performance.

The aim of this EMPr is to achieve the above objectives by:

- Defining the environmental management objectives to be realised during the life of the project, in order to enhance benefits and minimise adverse environmental impacts;
- Describing detailed actions needed to achieve these objectives, and mechanisms that address changes in the project implementation, emergencies and unexpected events;
- Clarifying institutional structures, roles, communication and reporting processes;
- Describing the link between the EMPr and associated legislated requirements; and
- Describing requirements for record keeping, reporting, review and auditing.

The purpose of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures identified in the Environmental Impact Assessment (EIA) process, and to help achieve environmental policy goals. Moreover, this EMPr ensures the Applicant and its contractors/staff are in compliance with the recommendations and conditions determined through the EIA process, as well as guarantee continuous improvement of environmental and social performance, reducing negative impacts and enhancing benefits of the proposed project.

This EMPr is a dynamic document, which should be updated when required. This EMPr will be updated to include inputs from interested and affected parties (I&APs) during the public review and comment period before final approval from the DFFE. Moreover, it should be considered critical that the EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility - this will ensure that project activities are planned and implemented taking into account a changing environment and sensitive environmental features.

Table 1-1: Content of the EMPr in terms of the NEMA and Appendix 4 of the EIA Regulations of December 2014 (as amended).

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		**EMPr Reference**
(1) An EMPr must comply with section 24N of the Act and include-details of		
(a)	*(i) the EAP who prepared the EMPr; and* *(ii) the expertise of the EAP to prepare an EMPr, including a curriculum vitae;*	Section 1.1
(b)	*A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;*	Section 3
(c)	*a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitives of the preferred site, indicating any areas that should be avoided, including buffers;*	Figure 3

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		EMPr Reference
(d)	*a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment processed for all phased of the development including-* *(i) planning and design;* *(ii) pre-construction activities;* *(iii) construction activities;* *(iv) rehabilitation of the environment after construction and where applicable post closure; and* *(v) where relevant, operation activities;*	Section 4 - 27
(f)	*a description of proposed impact management actions, identifying the manner in which the impact management outcomes and contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to-* *(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;* *(ii) comply with any prescribed environmental management standards or practices;* *(iii) comply with any applicable provisions of the Act regarding closure, whre applicable; and* *(iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;*	Section 4 - 27
(g)	*the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Section 4 - 27
(h)	*the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Section 4 - 27
(i)	*an indication of the persons who will be responsible for the implementation of the impact management actions;*	Section 4 - 27
(j)	*the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;*	Section 4 - 27
(k)	*the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);*	Section 4 - 27
(l)	*a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;*	Section 4 - 27
(m)	*an environmental awareness plan describing the manner in which-* *(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and* *(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and*	Section 4 - 27
(n)	*any specific information that be required by the competent authority.*	Section 4 - 27

2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESSES

The EIA for the 275 MW WEF was completed and received EA in 2018. Subsequent to the issue of the EA, an application was submitted to the DFFE to split the 275 MW facility into two, namely Phezukomoya WEF and Hartebeesthoek West WEF.

Due to the split / amendment to the layout of the facility, the specialist studies were updated and the potential impacts reassessed. Potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. Negative impacts of the proposed project on the biophysical environment included clearing of vegetation that leads to habitat fragmentation, potential loss of species of concern, soil erosion, and surface

water pollution; while social-economic impacts being minimal loss of agricultural land, disruption of social relations within the proposed area by the potential influx of jobseekers, spread of diseases, loss of potential heritage resources and impact on sense of place.

All impacts were identified and reassessed at different stages (design/planning, construction, operation and decommission) and possible mitigation or enhancement measures assigned to reduce the significance of negative impacts or enhance positive impacts were provided in the specialist reports (2019). Mitigation measures proposed by the specialists were included in this EMPr.

As this is a legally binding document, all mitigation measures included herein must be adhered to by the developer and operator as applicable.

2.1 EMPr Update

Condition 16 of the EA for the Hartebeesthoek West WEF (DFFE Reference 14/12/16/3/3/2/1028/2 and 14/12/16/3/3/1/1028/2/AM3), established that the EMPr was not approved and should be amended to include measures as dictated by the final site lay-out map and micro-siting, and the provisions of the EA.

The following specialists conducted a walkthrough of the site to assist with micro-siting the layout of turbines and other infrastructure:

- Aquatic Specialist
- Flora and Fauna Specialists
- Avifaunal Specialist
- Bat Specialist
- Archaeological Specialist

This EMPr, for the Hartebeesthoek West WEF represents the requested update to the previous EMPr submitted, including any new mitigation measures that were incorporated in the specialist's assessments (Original Reports, 2016; Amendment Reports, 2019; and Specialist Assessments based on the Conditions of the EA, 2021 - 2023). A Final Layout and Environmental Sensitivity Map (Figure 2 - 3) is attached to this EMPr.

Based on the results of the above mentioned specialists walk through assessments, the sections below provide their recommendations used for the final site layout and micro siting and this EMPr. The specialist walkthrough assessment reports are included as Volume II.

2.1.1 Aquatic

Following the walkthrough, the initial aquatic assessment findings can be upheld. In a comparison between the original and final layout. Very high sensitivity impacts are not anticipated, as there is no direct impacts to any critical aquatic ecosystems. These are based on the consideration that with the exception of two-watercourse crossing for the internal grid connections, the proposed wind farm layout has avoided all the important or high sensitivity aquatic systems.

Based on the amended layout and walk through, the grid connection towers will be placed outside any of the indicated aquatic zones and access tracks will only be required in some areas along the proposed corridors. It is recommended (where possible) to use existing tracks and not to create new crossings within these systems. Should new crossings be required these must be licensed under the appropriate General Authorisation in terms of Section 39 of the National Water Act 36 of 1998 (NWA, 1998).

The aquatic specialist therefore does not object to the approval of any of the required water use authorisations for this facility. Based on the potential threshold triggers General Authorisations would seem appropriate. This is based on the condition that all the mitigations in the previous aquatic assessment (2018 and 2019) (including EMPr

recommendations) and as identified in the Risk Assessment Matrix (Appendix C) are considered during the activities of the development.

The 21 (c) and (i) Risk Assessments conducted (Appendix C) further indicates that the proposed water uses will have a low risk rating after considering all listed control measures. Specific control measures are listed for the transmission line, but in essence as the designs are finalised, any of the required access track / road crossings must be evaluated on a case by case basis to ensure that the potential impacts remain low (habitat disturbance and erosion).

Due to the low risk ratings, a General Authorisation in terms of Section 39 of the National Water Act (NWA), 1998, could be issued for the development (Table 2-1). This is mostly substantiated by the fact that the proposed layout will avoid critical aquatic features (wetlands), which are also highlighted in the Northern Cape Biodiversity Spatial Plan as Critical Biodiversity Area Type 1 and 2 areas (Holness & Oosthuysen, 2016).

Table 2-1: Section 21 Uses of the Hartebeesthoek WEF

Section 21 Uses	Affected aquatic resources	Impact with mitigation
c & i	Any internal roads and or underground cables that cross watercourses. The watercourses have been avoided by most of the wind structures with the exception of one crossing (High sensitivity areas)	LOW – as the impact system only contains flows for a minimal timeframe approximately every 5-10 years.
c & i	132 kV Overhead grid connection access roads, with some portions of the proposed alignment within the watercourse including a 32 m buffer	LOW – as towers / pylons can be placed outside any aquatic systems and their buffers, however access roads may need to cross certain areas although several existing tracks will be used as far as possible. The number of applications will be considered once the tower positions have been determined and / or formalised access crossings have been investigated.

The following recommendations are reiterated:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be well outside any demarcated water courses.
- All cleared areas must be re-vegetated after construction has been completed.
- All alien plant re-growth (mostly forbs) must be monitored, and should it occur, these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.

2.1.2 Flora and Fauna

The ecological sensitivity of the development site is determined largely by the topography and elevation of the landscape. The only no-go area that was observed within the development area was the small gorge with springs and wetlands. This area has been avoided by the development and the layout is considered generally acceptable, although

there were a few turbines, which were marginally within areas considered to be High sensitivity and which have since been removed or adjusted to avoid these areas.

Since the original ecological assessments were undertaken for each of the separate wind energy facility projects, the specialist walkthrough was undertaken for the wider project area and thus it has been possible to refine and better understand the vegetation composition and local distribution of flagged species of conservation concern within the greater area of influence. Several Species of Conservation Concern were identified during the initial ecological assessments. In addition, with the inclusion of additional available information, observations and surveying during the walkdown, several additional species have been identified.

Flora and Fauna Species of Conservation Concern

The species are widespread and are not associated with any specific turbine or WEF infrastructure component. Several geophytic species are also likely to be present but were not recorded during the initial assessment and were not visible during the walkthrough, as the season was not favourable. Respective permits will be required before commencement of flora relocation.

Sensitive Areas and Species Population

Sensitive areas identified either in the original biodiversity assessment and/or observed during the walthrough include the following:

- Rocky Outcrops and Ridges on slopes and mountain peaks – outcrops generally have a greater density of succulent species (*Aizoaceae* and *Crassulaceae*) that will require relocation;
- Aquatic processes of rivers, seeps, watercourses, wetlands and;
- Sub-populations of flagged species of conservation concern – often associated with rocky areas; and
- Slope and mountain edges.

Turbines, Roads and Other Infrastructure

A summary analysis of specific infrastructure risks is provided in Table 2-2 below.

Table 2-2: Summary of WEF and infrastructure vegetation and sensitivities

Turbine	Habitat[1]	Comment
HW1 (HB1)	Rocky/Grassland	No issue
HW2 (HB2)	Rocky/Grassland	No issue
HW3 (HB4)	Rocky/Grassland	No issue
HW4 (HB5)	Rocky/Grassland	No issue
HW5 (HB6)	Rocky/Grassland	No issue
HW6 (HB10)	Rocky/Grassland	No issue
HW7 (HB11)	Grassland	No issue
HW8 (HB12)	Rocky/Grassland	No issue
HW9 (HB16)	Rocky/Grassland	No issue
HW10 (HB20)	Rocky/Grassland	No issue
HW11 (HB23)	Rocky/Grassland	No issue
Substation	Rocky/Grassland	No issue

[1] Rocky habitat generally more likely to have more species of conservation concern for relocation as well as reptiles (snakes and lizards).

Turbine	Habitat[1]	Comment
Powerline	Rocky/ Grassland/ Shrubland	No issues

During the walkthrough visit, several turbine footprints were identified that overlapped slightly with outcrops. Based on the recommendation, the developer had made layout adjustments to avoid such areas where possible. The following specific recommendations is required for the project:

- A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing. A comprehensive list of species for which permits will be required is provided in Appendix D.
- Where turbine footprints could not be moved to avoid overlap with outcrops, minor layout adjustments should be implemented during final surveying and pegging out to avoid such areas where possible. Rocky outcrops should not be removed unnecessarily where they can be avoided.

2.1.3 Avifauna

The results of the original pre-construction monitoring, as well as additional nest searches conducted subsequently (11 – 15 April 2021), were used as the basis for the recommendations provided.

A total of seven (7) Verreaux's Eagle nests were recorded during nest searches around the proposed WEF, which falls within the potential impact zone of the proposed WEF and associated grid connection. As the developer has reduced the number of turbines from the original authorised 12 turbines to an optimised layout of 11 turbines, this is a significant benefit from an avifaunal perspective, as the resulting 16% reduction in the number of turbines will reduce the collision risk based on *Thaxter et al.* (2017) analyses.

The recommended buffer zones listed below replaced the proposed buffers zones[2] listed in the original specialist study (2017):

- The 3.4 km buffers are turbine no-go buffers to mitigate against turbine collisions. Other infrastructure is allowed.
- The 5.2 km buffers are areas where turbines can be constructed subject to pro-active mitigation (see below).
- The 1.5 km buffers are no-go buffers for all infrastructure to prevent the disturbance of breeding Verreaux's Eagles.

Further recommendations for inclusion in the EMPr are provided below:

- It is recommended that suitable pro-active mitigation be implemented at all turbines up to 5.2 km from a Verreaux's Eagle nest, once the wind farm commences with operations. This could include measures such as blade painting and/or Shutdown on Demand, to reduce the risk of collisions of Verreaux's Eagles. Suitable pro-active mitigation measures should be selected prior to commencement of operation, informed by best-available information at the time of implementation.
- It is recommended that 33 kV cables are buried where technically possible.
- Those sections where the medium voltage cable should preferably not be trenched due to technical or environmental reasons, but needs run on overhead poles, the proposed 33 kV pole designs must be approved by the avifaunal specialist, to ensure that the designs are raptor-friendly.

[2] The 2d edition of the Verreaux's Eagle Guidelines were finalised in November 2021 and incorporates the Verreaux's Eagle Risk Analysis model developed by Dr Megan Murgatroyd, which identifies high, medium and low risk areas for breeding adults, or alternatively recommends an increased high risk no-go area of 3.7km around nests, and pro-active mitigation for all turbines within a 5.2km medium risk radius around a nest. However, the current planned lay-out of 15 turbines are located >5.2km from any of the planned turbines.

- It is recommended that bird flight diverters are fitted to all the 33 kV overhead lines.

All turbines and infrastructure currently adhere to the buffer zones. All mitigation measures proposed in the avifauna impact report, and which are included in the EMPr, are to be strictly adhered to.

2.1.4 Bats

The aim of the site walkthrough and micro-siting process was to ground truth important bat features. Further to this, the walkthrough was conducted to ensure that all turbine blades and other infrastructure are positioned outside of their respective bat sensitivity buffers.

The site walk-through visit took place from 18 to 23 October 2021. Important bat features, sensitivities and final layouts were loaded onto the ArcCollector app to ground truth the features and update the sensitivities accordingly. The positions of the turbines, powerlines, roads, substation, and transformer were prioritised. Additionally, habitats with roosting potential were identified beforehand and inspected for possible bat roosts, which included rocky outcrops, cliffs, buildings and trees.

During the site visit, additional important bat features were identified (including dams, water pumps and drainage lines), as well as features that did not require buffers (such as drainage lines that were not apparent, or missing water features). Buffers were defined based on these observations. In the original assessment, sensitive areas were defined as either high (with a 200 m buffer) or moderate (with a 100 m buffer). For the purpose of micro-siting, the current authorised layout, the buffers in the constraints map have been refined from the original assessment and should be viewed as no-go areas for turbines (Figure 2 - 3). All buffers presented during the original assessment were included in these refined no-go areas. As the moderate sensitivity areas have not been altered, the recommendations set out in the original EIA should still apply. The no-go buffers consider the authorised blade length (87.5 m) and hub height (137 m) and subsequently considers the distance to turbine base.

All turbines currently adhere to the buffer zones. All mitigation measures proposed in the pre-construction bat impact report, and which are included in the EMPr, are to be strictly adhered to.

2.1.5 Heritage / Archaeology

Given the previous assessments of the site, the coverage already achieved and the specialist knowledge of the heritage potential of the site, the pre-construction survey did not aim to resurvey the entire WEF layout, but rather to fill in gaps in previous survey coverage particularly in accessible areas where there was the potential for archaeological sites and material to be present. No trial holes were dug and no material was removed from the project area, all observations were based on visible surface material.

The current design and layout of the Hartebeesthoek West WEF has taken the results of the 2017 and 2019 archaeological assessments into account and the sensitive areas are sufficiently distant from WEF infrastructure not to be affected, or are of sufficiently low heritage significance (i.e., not conservation-worthy) that their loss, should it occur, would be tolerable.

The assessment found that while a number of significant heritage resources may be impacted by the construction of the Hartebeesthoek West WEF, provided the mitigation measures recommended are implemented, the overall impact of the construction of the WEF is likely to be of low significance and tolerable from an archaeological perspective.

3 THE HARTEBEESTHOEK WEST WEF DEVELOPMENT

The Hartebeesthoek West WEF received EA on 26 October 2021 for a total WEF output of 74.4 MW, which comprised up to 12 wind turbines with a generation capacity of 6.2 MW each.

Following receipt of the Strategic Integrated Project (SIP) No. 20 c registration, the final layout will consist of up to 11 turbines for a total WEF output of up to 74.4 MW.

The wind farm will connect to a collector substation via medium voltage lines, which will, in turn, connect to the Umsobomvu Substation via an authorised 132 kV transmission line. The new on-site substation, SK-PH collector substation, and other associated infrastructure received environmental authorisation on 29 September 2021 (DFFE Reference 14/12/16/3/3/1/2076/3).

Table 3-1 and 3-2 below provides the co-ordinates and technical details of the development as authorised in the HBH West WEF EA.

Table 3-1: Co-ordinates of the Hartebeesthoek West WEF Site and Infrastructure

	Authorised Latitude	**Authorised Longitude**
North-West Corner	31° 14' 26.618" S	24° 58' 35.8612" E
North-East Corner	31° 14' 08.4855" S	24° 59' 46.0334" E
South-West Corner	31° 16' 21.9496" S	24° 59' 00.6293" E
South-East Corner	31° 15' 49.4609" S	25° 00' 56.5265" E
Substation location (centre point)	31° 15' 1.91" S	24° 55' 41.48" E
Construction camp laydown area	31° 12' 55.12" S	24° 54' 0.97" E

Table 3-2: Technical Details of the Hartebeesthoek West WEF (currently authorised)

Component	**Description / Dimensions**
Location of the Site	Approximately 8 km south of Noupoort
Farm and SG Codes	47/182: C02100000000018200047 2: C04800000000000200000 RE/13: C04800000000001300000 1/11: C04800000000001100001 RE/13/1: C04800000000000100013

Component	Description / Dimensions
Site Access	Access to site: Access Point 1: -31.195496; 24.877421 Access Point 2: -31.195269; 24.961468 Access Point 3: -31.278405; 24940615 Access Point 4: -31.268857; 24.941613 Access Point 5: -31.206607; 25.052748
Export Capacity	Up to 74.4 MW
Proposed Technology	Wind Turbines
Number of Turbines	Up to 12
Hub Height from Ground Level	Up to 137 m
Rotor Diameter	Up to 175 m
Width and Length of Internal Roads	Internal roads width: Up to 14m during construction and up to 8m during operation Internal roads length: Approximately 50 km

3.1 The Final Hartebeesthoek Site Layout

The final site layout (Figure 2) has been refined based on the recommendations made post specialist and Engineering team (of the Applicant) site walkthroughs.

Turbine positions have moved slightly to accommodate any buffers recommended by the avifauna, ecological and heritage specialists (as per Section 2.1). Upon approval of the final layout and this EMPr by the DFFE, if any changes are made to the layout or EMPr this must be submitted to the DFFE for approval. Table 3.3 below provides the description of the final HBH East WEF turbine specifications.

Table 3-3: Technical Details of the Hartebeesthoek West WEF (to be approved)

Component	Description / Dimensions	
	Authorised Turbine Details	**Final Turbine Details**
Proposed Technology	Wind Technology	Wind Technology
Number of Turbines	Up to 20	11
Hub Height from Ground Level	Up to 137 m	124 m
Rotor Diameter	Up to 175 m	165 m

Width and Length of Internal Roads	Internal roads width: Up to 14m during construction and up to 8m during operation Internal roads length: Approximately 50 km	*Remain unchanged.*

3.2 Components of the WEF Development

The facility will comprise the following:

- A maximum generating capacity of 74.4 MW in total;
- 11 turbines with a generating capacity of up to 6.2 MW and a rotor diameter of 165 m, a hub height of 124 m and a blade length of 82.5 m (all maximums);
- Foundations (25 x 25 m) and hardstands associated with wind turbines;
- Internal access roads of between 8 m during operation and 14 m during construction wide to each turbine;
- Medium voltage cabling between turbines and the onsite switchin station (each approximately 1000 m^2), to be laid underground where technically feasible;
- Overhead medium voltage cables between the onsite substation and the San Kraal Substation and between turbines rows where necessary;
- A 25 km 132 kV high voltage overhead powerline from the onsite substation to the proposed Umsobomvu Substation to the national grid;
- Temporary infrastructure including a construction camp with atching plant (4000 m^2); and
- A laydown area approximately 7500 m^2 in extent per turbine.

The proposed project will comprise components as described below.

3.2.1 Turbines

Up to 12 turbines are approved, of which 11 turbines will be constructed. The turbines will be placed on steel and concrete foundations, which will each occupy an area of up to 25 m by 25 m in total (which includes the maximum total area that may need to be disturbed during construction of the foundation) and be typically up to 5 m deep and may include concrete and steel plinths depending on local ground conditions.

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

3.2.2 Hard Stand Areas

Each turbine requires an area of hard-standing to be built adjacent to the turbine foundation. This provides a flat, stable base on which to lay down the turbine components ready for assembly and erection and to site the two cranes necessary to lift the tower sections, nacelle and rotor into place.

A hardstanding area of up to 7500 m^2 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 layout turbine components prior to erection.

The crane hard-standing will be left in place following construction in order to allow for the use of similar plant, should major components need replacing during the operational phase of the proposed development.

3.2.3 Laydown Areas

Temporary infrastructure would include a site camp, laydown areas and a batching plant. Additional temporary laydown areas will be required for equipment and component storage

during construction across the site. These areas will be levelled and compacted and used for component storage.

3.2.4 Electrical Cabling and On-site Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to 1 x 80 MVA on-site substation. Where possible this will be underground, but the feasibility of this will be confirmed as the design progresses and geotechnical studies are conducted. The on-site substation will house electrical infrastructure such as transformers and switchgear to enable the energy to be transferred into the existing national grid. The operations and maintenance building including parking will be approximately 7500 m^2.

Underground cabling will link the turbines to each other and to the on-site transformer / control building. Detailed construction and trenching specifications will depend on the ground conditions encountered. Typically, cables would be laid in a trench approximately 1 m deep and 0.5 m wide. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable.

3.2.5 Access

The turbine locations will be accessed through a network of unsealed roads which will be established across the WEF Site. These access roads will be between 8 m and 14 m wide.

A width of 14 m is required for curves in order to allow trucks to turn. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access roads will be upgraded and utilised where possible, as will existing watercourse crossings. Some of the aggregate required for the construction of the on-site tracks may be sourced from cut and fill operations during construction from within the proposed development site with additional material imported from permitted quarries as required.

3.2.6 Compound

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

3.2.7 Ancillary Equipment

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

- Meteorological masts;
- Security fencing;
- Gate house;
- Operational and Maintenance Building; and
- CCTV monitoring equipment for the facility.

4 COMPLIANCE WITH THE EA

This section of the EMPr indicates compliance with the conditions (Table 4-1) and notes specific conditions (Section 4.2 – 4.6) of the EA, dated 26 October 2021 (DFFE Ref. 14/12/16/3/3/2/1028/2 and 14/12/16/3/3/2/1028/2/AM3), for which action is required on behalf of the Applicant and its Contractors/staff.

4.1 Compliance with the Conditions of the EA in the EMPr

Table 4-1: Compliance with the Conditions of the EA in the EMPr

EA Reference	EMPr Reference
16. the Environmental Management Programme (EMPr) submitted as part of the EIAr is not approved and must be amended to include measures as dictated by the final site layout map and micrositing and the provisions of this environmental authorisation. The EMPr must be made available for comments by the registered interested and affected parties and the holfer of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to the commencement of the activity. Once approved the EMPr must be implemented and adhered to.	The EMPr has been updated (Version 2) to include measures as provided by specialists as a result of the micro-siting and final site walkthroughs. This EMPr will be made available for public review and comment for the required 30 period, after which the EMPr will be updated with any additional requirements and submitted to the Department for approval.
17. The EMPr amendment must include the following:	
17.1 The requirements and conditions of this authorisation.	Section 4 of this EMPr informs where updates have been made accordingly with the conditions of the authorisation.
17.2 All recommendations and mitigations measures recorded in the EIAr.	Section 4 of this EMPr informs where updates have been made accordingly with the recommendations and measures as recorded in the EIAr and the Amendment Reports.
17.3. All mitigation measures as listed in the specialists reports must be included in the EMPr and implemented.	The EMPr includes the recommendations and measures as recorded in the specialists EIA report, Amendment Reports and the Walkthrough Reports.
17.4. The final site layout map.	See Figure 2.
17.5. Alien invasive management plan to the implemented during the construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monutring and removal of alien species is undertaken.	Section 12 - Alien Invasive Management Plan
17.6. A plant rescue and protection plan which allows for the maximum transport of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialists familiar with the site in consultation with the ECO and be implemented prior to the commencement of the construction phase.	Section 13 – Plant Rescue and Protection Plan Section 15 – Open Space Management Plan

EA Reference	EMPr Reference
17.7. A revegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of the construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Section 14 – Revegetation and Habitat Rehabilitation Plan
17.8. A traffic management plan for site access roads to ensure no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters, e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon cummute time and avoid using roas through densely populated built up areas so as not to disturb existing retail and commercial operations.	Section 16 – Traffic Management Plan Section 17 – Transportation Management Plan
17.9. A construction and operational avifauna and bat monitoring plan.	Section 22 - Avifuana Management Plan Section 23 – Bat Management Plan
17.10. A conservation management plan must be drafted and submitted to SAHRA for review and comment. The management plan, as recommended by SAHRA must be included in the final EMPr.	Section 25 – Heritage Conservation Management Plan
17.11. A storm water management plan to be implemented durinf the construction and operation of the facilitiy. The plan must ensure compliance with the applicable regualtiosn and prevent off site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measure must promote the dissipation of stormwater run-off.	Section 19 – Stormwater Management Plan
17.12. An erosion management plan for monitoring and rehabiliatating erosion events associated with the facility. Approriate erorion mititgation must form part of this plan to prevent and reduce the risk of any potential erosion.	Section 20 – Erosion Management Plan
17.13. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transporation, handling, use and storage. This must include precautionary measures to limit the possibility of oul and other toxic liquids from entering the soil or storm water systems.	Section 27 – Fuel Stotage Measures

EA Reference	EMPr Reference
17.14.A fire management plan to be implemented during the construction and operational phases.	Section 21 – Fire Management Plan
17.15. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams, and their catchments, and other environmental sensitive areas from construction impacts include the direct and indirect spillage of pollutants.	Section 27 – Fuel Stotage Measures
17.16. An environmental sensitivity map indicating environmental sensitive areas and features indentified during the EIA process.	Figure 3
17.17. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the proposed location of the turbines as stated in the EIAr and this authorisation.	Figure 3
18. The final amended EMPr (once approved) must be implemented and strictly enforced during all phases of the project. It shall be seen as a dynamaic document and shall be included in all contract documentation for all phases of the development when approved.	
19. Changes to the approved EMPr must be submitted in accordance to the EIA Regulations applicatble at the time.	

4.2 Frequency and Process of Updating the EMPr

- Condition 21: The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 28 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the environmental auhorisation or EMPr.
- Condition 22: The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.
- Condition 23: The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation, 34 of GNR.982. The updated EMPr must have been subjected to a public participation process, which process has been agreed to by the Department, prior to the submission fo the updated EMPr to the Department for approval.
- Condition 24: In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of GNR.982. Prior to approving an amended EMPr the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides avoidance, management, and mitigation of environmental impacts associated with the undertaking of the activity.
- Condition 25: The holder of the authorisation must apply for an amendment of an EMPr, if such amendment is required before an audit is required. The amendment process is prescribed in Regulation 37 of the EIA Regulations, 2014, as amended. The holder of the authorisation must request comments on the proposed amendments to the impact management outcomes of the EMPr or amendments to the closure objectives of the closure plan from potentially interested and affected parties, including the competent

authority, by using any of the methods provided for in the Act for a period of at least 30 days.

4.3 Monitoring

Condition 26:

- The holder of the environmental authorisation must appoint an experienced Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/ rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
    - The ECO must be appointed before the commencement of any authorised activities.
    - Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department.
    - The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule fo tasks undertaken by the ECO.
    - The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.

4.4 Recording and reporting to the Department

- Condition 27: All documentation e.g. audit / monitoring / compliance reports and notifications, required to be submitted to the Department in terms of this environmental authorisation, must be submitted to the Director: Compliance Monitoring of the Department.
- Condition 28: The holder of the environmental authorisation must, for the period during which the environmental authorisation and EMPr remain valid, ensure that the project compliance with the conditions of the environmental authorisation and the EMPr are audited and that the audit reports are submitted to the Director: Compliance Monitoring of the Department.
- Condition 29: The frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicted in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GNR. 982.
- Condition 30: The holder of the environmental authorisaiton must, in addition, submit environmental audit reports to the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and a final environmental audit report within 30 days of completeion of rehabilation activities.
- Condition 31: The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations 2014 and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions as well as the requirements of the approved EMPr.
- Condition 32: Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

4.5 Notification to Authorities

- Condition 33: A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purpose of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.

4.6 Operation of the Activity

- Condition 34: A written notification of operation must be given to the department no later than fourteen (14) days prior to the commencement of the activity operational phase.

5 LEGAL FRAMEWORK

The Hartebeesthoek West WEF EA, in terms of the NEMA, 1998, EIA Regulations, 2014, as amended, has been approved for the following listed activities.

Table 5-1: The NEMA,1998 EIA Regulations 2014, as amended, listed activities authorised for the Hartebeesthoek West WEF

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
Listing Notice 1 GN R 327 Activity 11	*The development 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 kilovolts.*	The WEF will require transmission lines in order to connect to the grid. Electrical reticulation will be installed to transfer electricity from the turbines to an on-site substation. Cables will be installed underground where feasible.
Listing Notice 1 GN R 327 Activity 14	*The development and related operation 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 meters or more but not exceeding 500 cubic meters.*	Estimated volume of hazardous materials stored on site over a construction period of 24 months: construction phase 176.64 m^3 and operational phase 197.62 m^3.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the WEF will include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and, in some instances, may exceed 10 cubic metres. The construction of associated infrastructure, such as access tracks crossing watercourses may require excavation and/or infilling of watercourse areas.
Listing Notice 1 GN R 327 Activity 24	*The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Access roads will be required between turbines. These roads will be unsealed and will likely be between 8 - 14 m in width. The roads will be up to 14 m wide during construction, but will be reduced during operation.
Listing Notice 1 GN R 327 Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and will be wider than 8 meters in some areas.

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
	or lengthening occur inside urban areas.	
Listing Notice 2 GN R 325 Activity 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*	The WEF will consist of a number of wind turbines for electricity generation of more than 20 megawatts (up to 74.4 MW).
Listing Notice 2 GN 325 Activity 6	*The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.*	The construction of the WEF may require a Water Use License in terms of the National Water Act, 1998 (Act No. 36 of 1998).
Listing Notice 2 GN 325 Activity 9	*The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.*	The construction of the 132 / 400 kV substation yard at the proposed Umsobomvu Substation.
Listing Notice 2 GN R 325 Activity 15	*The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *the undertaking of a linear activity;* *maintenance purposes undertaken in accordance with a maintenance management plan.*	The construction of the WEF will require the clearance of approximately 150 hectares of vegetation in total across the site.
Listing Notice 3 GN R 324 Activity 4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *a. Eastern Cape:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *g. Northern Cape* *Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and parts of the site fall within a National Protected Area Expansion Strategy Focus area and CBA in the Northern Cape.
Listing Notice 3 GN R324	*The clearance of an area of 300 square metres or more of*	The development will require the clearance of natural vegetation in

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
Activity 12	*indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *g. Northern Cape* *iii. Within critical biodiversity areas identified in bioregional plans*	excess of 300 m^2 in areas of natural vegetation. A portion of the WEF is located within a Critical Biodiversity Area in the Northern Cape.
Listing Notice 3 **GN R324** **Activity 18**	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *a. Eastern Cape:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *g. Northern Cape* *ii. Outside urban areas* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas identified in systematic bioregional plans adopted by the competent authority or in bioregional plans*	Existing farm roads will need to be widened or lengthened. The site lies outside urban areas, and contains NPAES and CBAs in the Northern Cape section.

6 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMPr and outlines the specific mitigation measures for those key impacts identified for the development of the Hartebeesthoek West WEF.

6.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the NEMA, 1998 (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.

6.1.1 Legally Binding Documents

A copy of the EA (Appendix F), the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying -

- At the site of the authorised activity;
- To anyone on request; and
- Where the holder of the EA has a website, on such publicly accessible website.

6.2 Roles and Responsibilities for Good Environmental Management

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

Environmental Manager - Developer Representative

- Review and approve final EMPr prior to authorisation by the DFFE.
- Review and approve any EMPr updates or amendments post approval of the EMPr.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the site environmental control officer (ECO) and environmental site officer (ESO) during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appoint a suitably qualified independent ECO and ESO during the construction phase.

Environmental Control Officer - Principal Contractor Representative

An independent ECO will work along-side the ESO to conduct the required inspections of the construction activities and EMPr implementation throughout the construction phase. After each monthly inspection, the ECO will produce a monitoring report that will be submitted to Developer / Applicant, the DFFE, and any other person(s) if required. Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The ECO will be responsible for overseeing the implementation of the EMPr during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the ESO and contractor with the EMPr, record-keeping and updating of the EMPr as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them.
- Ensure that the contents of the EMPr are communicated to the contractor, all site staff, and the contractor and /or site manager are made aware of the contents of the EMPr, through presentations and discussions.
- Ensure that compliance to the EMPr 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 ECO will be responsible for the following:

- Meeting on site with the Construction Manager and ESO prior to the commencement of construction activities to confirm the construction procedure and designated activity zones.

- Ensuring that daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities take place by the ESO to ensure adherence to the specifications contained in the EMPr. The ESO should use a monitoring checklist that is to be prepared by an independent environmental assessment practitioner (EAP) at the start of the construction phase.
- Preparation of the monitoring report based on the site visits and feedback by the ESO.
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager and ESO.
- Ensuring that the ESO maintains an Incidents Register and Complaints Register on site.

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

- Overseeing the ESO during the implementation of the EMPr for the operation phase.
- Ensure that the necessary environmental monitoring takes place as specified in the EMPr.
- Update the EMPr and ensure that records are kept of all monitoring activities and results.
- Ensuring that the ESO maintains an Incidents Register and Complaints Register on site.

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

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

Environmenal Site Officer

The ECO must appoint a nominated representative of the contractor as the ESO. The independent ESO is required to be on site at all times and will conduct the required inspections of the construction activities and ensure implementation of the EMPr throughout the construction phase. After each inspection, the ESO is required to submit a completed monitoring checklist to the ECO.

The ESO will be responsible for ensuring the implementation of the EMPr during the construction and operations phases by the contractor and providing feedback to the ECO regarding the compliance of the contractor with the EMPr and any updates required to the EMPr as and when necessary.

The ESO will:

- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them.
- Ensure that the contents of the EMPr are implemented by the contractor, all site staff.
- Ensure that compliance to the EMPr is monitored by regular and comprehensive inspection of the site and surrounding areas.
- Report on any incidents of non-compliance to the ECO and ensure mitigation measures are implemented as soon as practical.

Contractor

An independent contractor be responsible for the implementation of the EMPr in accordance with the requirements of the EA.

The Contractor will:

- Be fully knowledgeable with the contents of the EMPr.

- Ensure that the contents of the EMPr are understood by all site staff.
- Report on any incidents of non-compliance to the ESO and ensure mitigation measures are implemented as soon as practical.

Environmental Auditor

The Developer must appoint an Independent Environmental Auditor. The independent Auditor is required to undertake bi-monthly (every two months) site visits to conduct the required inspections of the compliance with the EA and EMPr during the construction and post construction phase of the activities. After each inspection, the auditor is required to submit an environmental audit report to the DFFE.

The ESO will be responsible for ensuring compliance of the EA and EMPr providing feedback to the ECO regarding the compliance and any updates required to the EMPr as and when necessary.

The Auditor will:

- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation and monitoring compliance with them.
- Submit reports to the DFFE.

6.3 Frequency for Auditing of Compliance and Submission of Reports

The developer must, for the period during which the EA and EMPr remain valid, ensure that compliance of the EA and EMPr are audited by an Independent Auditor. The Auditor will arrange for inspections of the activities and EMPr implementation throughout the construction and post construction phase. After each inspection, the auditor will produce an environmental audit report that will be submitted to the client, DFFE, and any other stakeholder as required. The monitoring reports, recommended to be produced by the ECO must be appended to the audit reports for submission.

The frequency of auditing and submission of the environmental audit reports must be on a bi-monthly (once every two months) basis, or what is deemed necessary in consultation with the ECO during times of heavy earth works and vegetation clearing, to ensure compliance with all aspects of the EA and EMPr.

6.4 Training and Induction of Employees

The ECO 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 EMPr 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 EMPr 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 EMPr. They shall know and understand the specifications of the EMPr and be able to assist other staff members in matters relating to the EMPr.

The ECO and / or ESO must ensure that all staff working on site have 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.
- Healthy and Safety.
- Fire management.
- HIV/AIDS.

6.5 Complaints Register and Environmental Incidents Book

Any complaints received from the community must be brought to the attention of the ECO / ESO, 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; and
- Actions taken and by who.

6.6 Construction Environmental Monitoring

In order to facilitate communication between the Environmental Manager, the ECO and the ESO, 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 EMPr may be justified as failure to comply with instruction from the highest authority.

6.7 Dealing with Non Compliance with the EMPr

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMPr. 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. When dealing with non-compliance, the following process is recommended to take place:

- A notice of transgression should be issued to the transgressor;
- It must be documented in a designated register; and

- It must be reported in a monthly report and made available to I&APs and DFFE upon request.

National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

6.8 EMPr Amendments and Instructions

No EMPr amendments shall be allowed without the prior approval of the DFFE. Amendments may be possible, following discussions with the relevant ECO, who may propose EMPr amendments on behalf of the developer or issue EMPr instructions, corrective actions, remediation or rehabilitation. These correction actions must be completed within the specified timeframes.

7 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.
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.
- To ensure that the facility design responds to the identified environmental constraints and opportunities.
- To implement effective communication methods and practices.

7.1 Mitigation Measures for Legal Compliance

- Walkthrough of final layout to be undertaken by specialists as required in the EA, unless already completed.
- Appoint an independent ECO.
- Appoint an internal ESO 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.
- The contractor must ensure conditions described in the environmental authorisation are adhered to.
- Confirm with ESO / 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 where possible.
- Environmental awareness training for site personnel, 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.
- The Contractor, together with the ESO shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. Training developed by the Contractor and ESO must be approved by the ECO.

- Site personnel operating light, and heavy duty 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.
- Before construction begins, all areas to be developed must be demarcated by a qualified surveyor.
- No construction camps are allowed on site. No workers are allowed to stay overnight in the construction area.
- The developer is to compile and implement a grievance mechanisim procedure for the public.
- The contractor to develop a 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.
- Once the final layout plan has been approved the appointed responsible engineers must produce a storm water management plan ('SWMP') for the site, during the construction and operational phases of the project. An effective SWMP will include bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- A floral rehabilitation programme should be implemented prior to operation, refer to Section 14. The programme addresses the rehabilitation of the existing habitats as well as the rehabilitation of areas disturbed during construction and decommissioning and investigate the potential of rehabilitating previously transformed or degraded areas. This rehabilitation programme must be approved by the relevant government departments and the relevant permits must be obtained for the handling/transport/propagation of protected species.
- For unavoidable destruction of natural vegetation, a habitat rehabilitation programme should be implemented before operation and following decommissioning, refer to Section 14. The programme must address the rehabilitation of the existing habitats as well as the rehabilitation of areas disturbed during construction and investigate the potential of rehabilitating previously transformed or degraded areas. This rehabilitation programme must be approved by the relevant government departments and the relevant permits must be obtained for the handling/transport/propagation of protected species.
- No-go buffer zones must be made around the historical farm complexes.
- Maintain a 500 m no development buffer zone around each of the two pans at 31°14'15.02"S 25° 2'44.17"E and at 31°13'55.42"S 25° 2'50.37"E to protect the pair of Blue Cranes from disturbance.
- Comprehensive route assessment is recommended to take place by the Contractor as per the traffic management plan mitigation measures.
- Confirmation of approval by provincial / local road authority and permits must be sought by the Contractor.
- Permits and/or Approval of Plans, as recommended in this EMPr must be obtained, such as search and rescue, Water Use License (WUL), and SAHRA, etc.
- A health and safety plan must be drawn up to ensure worker safety.
- 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.
- 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 located within 1:50 year floodlines.
- Sensitive areas.

7.2 Permit Requirements

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the EA. Hartebeesthoek Wind Power (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations. Additional permit requirements which may be required are described below.

7.2.1 Borrow Pits

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. Hartebeesthoek Wind Power (Pty) Ltd or their contractors may want to use borrow pits for certain earthworks operations, such as the construction of roads, embankments, bunds, berms, and other structures. Licenced borrow pits will be used to source material. There is an existing quarry on site which will be used, if possible.

The establishment of borrow pits is regarded as a mining activity and is legislated in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA). A mining permit must be obtained from the Department of Minerals and Energy prior to the establishment of borrow pits on the site.

7.2.2 Water Use License

There are licensing procedures that need to be followed for particular "water uses" under the National Water Act, 1998 (Act No. 36 of 1998). Water uses that may be of relevance to the development and associated road construction include the following:

- Taking of water from a water resource, including a water course, surface water, estuary or aquifer (i.e. borehole);
- Altering the bed, banks, course or characteristics of a water course; and/or
- Impeding or diverting of a flow in a water course.

Under the National Water Act, 1998 (Act No. 36 of 1998), a General Authorisation application is underway.

7.2.3 Heritage, Archaeology and Palaeontology

Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities above, all works must be stopped immediately and and heritage authorities must be notified without delay.

7.2.4 Vegetation Search and Rescue

Under the Forests Act, 1998 (Act No. 84 of 1998) (NFA), a license must be applied for from the Department of Agriculture, , Land Reform and Rural Development (DALRRD), for the removal or disturbance of any protected trees on the site, in terms of the List of Protected Tree Species promulgated under the NFA.

7.3 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.

7.4 Policies and Plans to be produced prior to Construction Commencing for IFC Requirements

The requirements below are not specifically required for the approval of this EMPr, this is required for the developer should the project require funding. The project developer will need to develop these policies.

- Project Environmental and Social Management System Framewok
- Project Environmental, Health and Safety and Social Policy
- Project Labout Policy
- Project Drug and Alcohol Policy
- Project Smoking Policy
- Project Code of Conduct
- Project Security Policy
- Project Grievance Mechanism for Workforce, and Takeholders and Communities
- Project Labour and Working Conditions Policy
- Project Stakeholder Engagement Plan

7.5 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.

The optimised site layout (including the location of construction camps and laydown areas) must be finalised through a micro-siting process, which will include a detailed site assessment of the final site layout by various specialists as stipulated in the EA and this EMPr. As this has been completed, refer to Section 2.1, the layout is now being subject to a comment and review period, after which it will be submitted to the DFFE for approval.

7.5.1 Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan[3]. 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.

[3] 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.
- Emergency exit and gathering points for in case of an emergency.
- 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 rehabilitated upon completion of the construction period, providing measures to be used for rehabilitation.

The following must also be undertaken:

- 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.
- During the pre-construction phase, the temporary construction camps and laydown areas must be located outside of the water courses (including the 45 m buffer determined from the edge of the water course).
- 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.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- 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 existing roads 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.

7.6 Siting, Establishing and Management Materials

- 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.
- Mitigation measures as provided in this EMPr must be adhered to during site establishment.
- Storage areas must be designated, demarcated and fenced.
- Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by children / animals etc.
- Fire prevention facilities and equipment 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 must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines on 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, South African National Standard (SANS) codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations[4].
- Flammable fuel and gas must be 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 fuel storage 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 fuel 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 fuel storage tank must be removed on completion of the construction phase of the project.
- All fuel storage tanks to be designed and constructed in accordance with the national standard for storage tanks, i.e., ISO 16961:2015 and a recognised international standard code if required.
- The rated capacity of fuel storage 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.

[4] https://www.nfast.co.za/gallery/fire%20extinguisher%20regulations.pdf

- 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 must 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 must only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- Any hazardous waste handling on site must be undertaken by experienced staff. No mixing of hazardous and general waste should be permitted.
- 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 of material or chemical, which may occur, shall be investigated and immediate action must be taken.

7.6.1 Site Clearance

- Vegetation clearance must preferably be phased as required to work in certain areas, rather than clearing of the entire site initially. If this is not practical and the entire site is cleared at the start of the contract, it is to be stabilized immediately to control dust. Wherever possible, vegetation shall be trimmed rather than cleared.
- Cleared vegetative material is not to be dumped anywhere other than an approved waste disposal site or an area as agreed to with the ECO.
- Wherever possible and where the material is suitable, the material must be chipped for later use as mulch in landscaped areas or for stabilization purposes or it must be dumped at a green waste recycling depot for compost production.
- Invasive alien plant species, which are removed from the site, are not to be chipped for mulch if they are in a seed bearing state. Such material is to be disposed of at a suitable waste disposal site. Wherever possible, suitable larger stumps must be made available to the local community as firewood.
- Plant material removed from the site is not to be burnt for disposal on site unless a burning permit has been obtained from the local authority.
- Sensitive ecosystems in the vicinity of the areas of construction must be demarcated (e.g. using danger tape or droppers) prior to any construction activities, so that these can be avoided.

- Removal of vegetation must be kept to a minimum, and cleared areas must be re-vegetated after clean-up. A detailed planting plan must be developed, in consultation with a landscaper and ecologist.
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development
- Demarcate all areas to be cleared with construction tape or similar material. However, caution must be exercised to avoid using material that might entangle fauna.
- An alien control and monitoring program, refer to Section 12, must be implemented to ensure that the site is cleared of alien plants (as listed under the Conservation of Agricultural Resources Act 43 of 1983 - as amended/updated) and kept free from alien plants for the duration of the construction phase.
- A low cover of vegetation must be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

7.6.2 Topsoil

Topsoil / top material shall be removed from all areas cleared of vegetation and retained for future landscaping use, where feasible. Top material must exclude litter, building rubble, alien plant material or any other waste.

All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in rehabilitation. This will constitute at least a 300 mm layer.

Topsoil shall be stored in areas demarcated by the ECO and Engineer and in piles not higher than 2 m, and may not be removed from site, or used for any purpose other than in the rehabilitation of the site post-construction. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization shall be as short as possible, and ideally the topsoil must be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling.

Stockpiles that are to be stored for less than three months must be covered with shade-cloth or Geotech fabrics or similarly suitable material to prevent erosion. If stockpiles are to be stored for more than 3 months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. If possible, the stockpile must be kept moist in order to maintain the vitality of the vegetation. Vegetation may not consist of weeds, but must comprise of grass or ground covers.

8 CONSTRUCTION PHASE MITIGATION MEASURES

The following sections form the core of the EMPr during the construction phase of the development. The major sources of potential impacts include, the turbine footprint construction, the construction of infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

The objectives of the construction phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the contractor complies with all mitigation measures during the construction period.

8.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the development. Specific mitigation measures for each impact is presented 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 water course by construction activities.
- Pollution of water courses.
- 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 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; and
- No alcohol or drugs are allowed on site.

Recommended persons as provided in Table 8.1 below should take responsibility for the implementation and monitoring to ensure that all construction mitigation measures outlined in this document, and all revisions thereof, are complied with.

Table 8-1: Design and Construction Phase Impact Management

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Creating New Road Paths		
Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks
Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).	Site engineer/ site contractor ESO to monitor	During site establishment
Keep tracks as narrow as possible and only drive on marked out routes (as per the Layout and Access Plan).	Site engineer/ site contractor ESO to monitor	Throughout construction Monthly checks
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.	Site engineer/ site contractor ESO to monitor	Throughout construction Monthly checks
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.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
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.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Only undertake earthworks in an area if it is unavoidable, and keep the size of platforms as small as possible.	Site engineer/ site contractor ESO to monitor	During site establishment

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Agricultural land use		
Minimize vegetation removal to the smallest possible footprint.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Control possible runoff by using soil conservation and soil retention measures, especially on steep slopes.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Store any removed topsoil for later use (contains indigenous seeds etc.) and re-vegetate as soon as possible.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Loss of riparian systems and water courses		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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 (crossing must have a small footprint).	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
No vehicles to refuel within drainage lines/ riparian vegetation.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
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.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Impact on riparian systems and 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.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Impact on localized surface water quality		
Strict use and management of all hazardous materials used on site.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Containment of all contaminated water by means of careful run-off management on the development site.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Working protocols incorporating pollution control measures (including approved method statements by the contractor) must be strictly enforced.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Impacts on vegetation and listed or protected plant species resulting from construction activities		
Placement of turbines within the High Sensitivity areas and drainage lines must be avoided.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Lay-down and other temporary infrastructure must be located within medium- or low-sensitivity areas. These areas must be rehabilitated after use.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Site access should be controlled and no unauthorised persons should be allowed onto the site.	ESO to monitor	Throughout construction Monthly checks
All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed. The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly marked as a no-go area.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
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 such fenced areas and not the outside.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Alien Plant Invasion Risk		
Wherever excavation is necessary, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
The recovery of the indigenous grass layer must be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. 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.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as these areas are also likely to be prone to invasion problems.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Disturbance, transformation, loss of habitat and direct fauna mortality		
Any fauna directly threatened by the construction activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks Post construction
The collection, hunting or harvesting of any plants at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as per the health and safety requirements as far as practically possible, which do not attract insects, and which should be directed downwards.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks
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.	Site engineer/ site contractor	Upon commencement

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
	ESO to monitor	Throughout construction Monthly checks
All construction vehicles should adhere to a low-speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
No excavated trenches or holes should be left open for extended periods as fauna may fall in and become trapped.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
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 needlessly persecuted.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Avifaunal Disturbance and Displacement		
Restrict the construction activities to the construction footprint area.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction Monthly checks
Do not allow any access to the remainder of the property during the construction period.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction Monthly checks
Measures to control noise and dust should be applied according to current best practice in the industry.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction Monthly checks
Maximum use should be made of existing access roads, and the construction of new roads should be kept to a minimum.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction Monthly checks
The ECO should be trained by an avifaunal specialist to identify the signs that indicate possible breeding by priority species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of such species, and such efforts may include the training of construction staff to identify such species, followed by regular	Developer to implement ECO / ESO to monitor Site engineer/site manager	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
questioning of staff as to the regular whereabouts on site of the species. If any priority species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and the avifaunal specialist will be contacted immediately for further assessment of the situation and instruction on how to proceed.	Specialist	
Bat Roost disturbance and/or destruction		
Adhere to the sensitivity map during turbine placement.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction
Blasting should be minimised and used only when necessary.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Throughout construction
Bat Habitat Modification and Displacement		
Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist.	ECO to implement ESO to monitor Site engineer/site manager Specialist	Upon completion of acitivities Throughout construction
Noise		
Construction activities should be should be limited to 06:00- 18:00 Monday to Saturday where practical, with no work on Sundays or public holidays or agreed with the local municipality.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Deliveries of turbine components, plant and materials by Heavy Goods Vehicle (HGV) to site should only take place by designated routes and within times agreed with the relevant authorities.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
The site contractors should be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228 Noise Standards.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
All sub-contractors appointed by the main contractor should be formally and legally obliged, and required through contract, to comply with all environmental noise conditions.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
No night time construction activities should be located within 800 m from potential noise-sensitive receptors.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Minimize or eliminate night-time traffic that may pass within 140 m (ideally) from noise-sensitive receptors for a noise impact of low significance within the development footprint.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Visual disturbance		
Maintain a neat construction site by removing rubble and waste materials regularly.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Ensure that dust suppression techniques are implemented on all access roads, especially those leading up steep slopes.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011) where possible. Bright colours or obvious logos should not be permitted.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Light fittings for security at night for all infrastructure should reflect the light toward the ground and prevent light spill.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment where possible. Non-reflective surfaces should be utilised where possible.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Heritage, Archaeology and Palaeontology		
Do not disturb and old stone kraals or ruins, do not remove stone from walls, or artefacts from the earth or earth surface.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Report any chance discoveries of human remains to an archaeologist or a heritage authority.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Do not demolish old structures and cottages without authority authorisation, ideally reuse old structures and cottages where possible.	Site engineer/site manager ESO to monitor	Upon commencement 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), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt / Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase / Mimi Seetelo 012 320 8490), must be alerted immediately.	Site engineer/site manager ESO to monitor	Throughout construction
A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	Site engineer/site manager ESO to monitor Specialist	Upon commencement Throughout construction
Safeguarding of chance fossil finds (preferably *in situ*) during the construction phase by the responsible ECO, followed by reporting of finds to reporting of finds to the responsible heritage management authority (SAHRA for the Northern Cape or the Eastern Cape Provincial Heritage Resources Authority (ECPRHA) for the Eastern Cape).	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Monitor at minum 10% of excavations / blasting into bedrock, as per SAHRA guideline.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Adhere to buffer zones as recommended by the palaeontologist.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
A qualified palaeontologist should record and judiciously sample significant chance fossil finds, together with pertinent contextual data (stratigraphy, sedimentology, taphonomy) within the final footprint.	Site engineer/site manager ESO to monitor Specialist	Upon commencement Throughout construction
Curation of fossil material within an approved repository (museum / university fossil collection) by a qualified palaeontologist, should any be found on site.	Site engineer/site manager ESO to monitor Specialist	Upon commencement
Creation of local employment, training, and business opportunities		
Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Before the construction phase commences the proponent should meet with representatives from the ULM and IYLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The local authorities, relevant community representatives and local farmers must 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.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where feasible a training and skills development programmes for local workers must be initiated prior to the initiation of the construction phase.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.	ECO / Development to implement Site engineer/site manager	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
	ESO to monitor	
The proponent should liaise with the ULM and IYLM 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.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where possible, the proponent, in conjunction with the ULM and IYLM, local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Risk to safety, livestock, farm infrastructure and farming operations		
The proponent must 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 must be signed before the construction phase commences.	ECO / Development to implement Site engineer/site manager ESO to monitor	Prior to construction Throughout construction
Contractors appointed by the proponent should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The proponent should consider the option of establishing a Mutual Fund 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.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement 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 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.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement 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 must be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The housing of construction workers on the site must be strictly limited to security personnel.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Increased incidence of fires		
The proponent must 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 must be signed before the construction phase commences.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The contractor must provide adequate firefighting equipment on-site.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Contractor must ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must 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 must be taken during the high risk dry, windy winter months.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must provide fire-fighting training to selected construction staff.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
No construction staff, with the exception of security staff, to be accommodated on site over night.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
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 must also compensate the firefighting costs borne by farmers and local authorities.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site		
The transport of components to the site along the N10 and N9 should be planned to avoid weekends and holiday periods, where possible..	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must inform local farmers and representatives from the district and local municipality Tourism directorate of dates and times when abnormal loads will be undertaken.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[5], adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
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 ESO to monitor	Throughout construction Monthly checks
The contractor must ensure that all 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 ESO to monitor	Throughout construction Monthly checks
The contractor must be required to collect waste along access roads on a weekly basis.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks

[5] Treated effluent (non-potable) water must be used for wetting of roads and construction areas.

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Waste generated during the construction phase must be transported to the local permitted landfill site.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
EMPr measures (and penalties) must be implemented to ensure farm gates are closed and speed limits are adhered to at all times.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Impact on Farmland due to Construction Related Activities		
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.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
The developer should consult with affected property owners in order to enable them to factor construction activities into their farming schedules.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., must be rehabilitated at the end of the construction phase. The rehabilitation plan must be discussed with the local farmer.	Site engineer/ site manager ECO to implement Specialist ESO to monitor	Post construction
The implementation of a rehabilitation programme must be included in the terms of reference for the contractor/s appointed.	Site engineer/ site manager ECO to implement	Preconstruction
The implementation of the Rehabilitation Programme must be monitored by the ECO.	Site engineer/ site manager ECO to implement ESO to monitor	Post construction
All workers must receive training / briefing on the reasons for and importance of not driving in undesignated areas.	Site engineer/ site manager ECO to implement	Preconstruction
EMPr measures (and penalties) must be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances must vehicles be allowed to drive into the veld.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Disturbance footprints must be reduced to the minimum.	Site engineer/ site manager	Pre-construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
	ESO to monitor	Throughout construction Monthly checks
If there are no agreements in place, compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
General Construction Mitigation Measures		
Potable toilets must be supplied to the workforce in areas of activity. One toilet per 15-20 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.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
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	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Health and Safety		
Implementation of safety measures, work procedures and first aid must be implemented on site.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Workers must be thoroughly trained in using potentially dangerous equipment.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Contractors must ensure that all equipment is maintained in a safe operating condition.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
A safety officer must be appointed.	ECO to implement	Pre-construction
A record of health and safety incidents must be kept on site.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Any health and safety incidents must be reported to the project manager immediately.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Workers have the right to refuse work in unsafe conditions.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
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 ESO to monitor	Throughout construction Monthly checks
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 ESO to monitor	Throughout construction Monthly checks
An STI and HIV/AIDS awareness campaign must be launched, which is not only directed at construction workers but also at the community as a whole.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Condoms must 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 must be approached with the necessary cultural sensitivity.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Access at the construction site must be controlled to prevent sex workers from either visiting and/or loitering at the construction camp.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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 ESO to monitor	Throughout construction Monthly checks
No person is to enter the site without the necessary PPE.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Pre-construction, construction and operation activities must be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays, where possible. No activity will be allowed on Sundays.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
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 ESO to monitor	Throughout construction Monthly checks
Increase traffic on the routes and access points to site		
Produce a Traffic Management Plan which must include the following mitigation measures: • The arrival and departure of construction vehicles should be staggered during off-peak periods to have a distributed effect over low volume traffic periods. • All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996. • The Project Manager and Site Safety Officer during construction and decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen. • Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition. • Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits. • Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.	ECO to implement Site engineer/ site manager ESO to monitor	Prior to construction Throughout construction Monthly checks

8.2 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.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface
- 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 must 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.

8.2.1 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, auction 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 ESO / ECO.

8.2.2 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.

8.2.3 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.

9 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF 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. During the operation and maintenance of the WEF (including the normal operation of the turbine itself) 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.

The objectives of the operation phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately.
- To ensure that the recommended monitoring programmes are implemented accordingly.

The main impacts associated with the operation phase of the WEF relate to birds and bats. A bird and bat specialist must be appointed to undertake the operational phase monitoring as per the EA and according to the applicable bird and bat guidelines at the time of commercial operations. Section 22 and 23 provides a guide to the plan required to be implemented.

Displacement of priority bird species due to habitat destruction during operational lifetime of the wind energy facility phase is likely to be a medium negative impact but will be reduced to a low level with the application of mitigation measures. Species most likely to be affected by the habitat destruction (particularly fragmentation) are the terrestrial species such as Blue Crane, Ludwig's Bustard, Secretarybird and Grey-winged Francolin. The rehabilitation of disturbed areas will help to mitigate the impact of the habitat transformation to some extent, but the fragmentation of the habitat due to the construction of the internal road network cannot be mitigated, and will remain an impact for the duration of the operational life-time of the facility.

Collisions of priority species with the turbines in the operational phase are likely to be a medium negative impact and it could be reduced to a low negative level through the application of mitigation measures. Species most likely to be at risk of collision with the turbines are Lesser Kestrel, Martial Eagle, Verreaux's Eagle and Jackal Buzzard. The impact is likely to persist for the operational life-time of the project. Implementation of the proposed mitigation measures should reduce the probability and severity of the impact on priority species to such an extent that the overall significance should be reduced to low.

Mortality of priority species with the grid connection and internal medium voltage network due to collisions in the operational phase is likely to be of medium significance, and will remain as such after the implementation of mitigation measures.

It is recommended that bat curtailment be applied from the start of operation at Level 3[6] on all turbines for every night of the year from dusk until dawn. Should robust and scientifically defendable data gathered during the operational study phase reveal higher bat mortalities than currently anticipated, the mitigations included in this EMPr should be applied to the turbines identified as causing the highest impacts, such as increasing to Level 5[7].

During operation of the development, the large majority of the WEF sites will continue with agricultural use as it is currently. The only development related activities on-site will be routine servicing and unscheduled maintenance. The noise impact from maintenance activities is insignificant, with the main noise source being the wind turbine blades and the nacelle (components inside).

Although noise and disturbance levels during operation will be significantly reduced compared to construction, some noise and disturbance impacts will persist due to operational activities on the wind farm as well as noise generated by the turbines themselves. Due to the low significance of a noise impact, no routine noise measurement programme is recommended. Measurement locations, frequencies and procedures are provided (Section 24) as a guideline for the developer to consider should there be a noise complaint.

As the affected areas are not considered to be very high faunal sensitivity and there are no species of very high sensitivity present, the post-mitigation operational impacts on fauna are likely to be of low significance.

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project there are no inhabited structures with or close to the project area therefore these impacts will not apply.

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

9.1 Potential Operation Phase Impacts and Management Actions

Recommended persons as provided in Table 9.1 below should take responsibility for the implementation and monitoring to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

[6] Refer to Section 23 for the decription of bat mitigation levels.
[7] Refer to Section 23 for the decription of bat mitigation levels.

Table 9-1: Operational Phase Impact Management

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Freshwater and Wetlands		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.	ECO to implement Operational Manager	Throughout operation Seasonal Checks
Culverts must be monitored to see if erosion issues arise and if any erosion control is required.	ECO to implement Operational Manager	Throughout operation Seasonal Checks
Appropriate ablution facilities should be provided for on-site staff during the operation of the facility.	ECO to implement Operational Manager	Throughout operation Seasonal Checks
Terrestrial Ecology		
Management of the site should take place within the context of an Open Space Management Plan.	ECO to implement Operational Manager	Throughout operation
Site access should be controlled and no unauthorised persons should be allowed onto the site.	Operational Manager	Throughout operation
Any fauna directly threatened by the operational activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	ECO to implement Operational Manager	Throughout operation
The collection, hunting or harvesting of any animals at the site should be strictly forbidden.	Operational Manager	Throughout operation
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) as far as possible, which do not attract insects.	Operational Manager	Throughout operation
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.	Operational Manager ECO to implement	Throughout operation
Speed limits on gravel roads should be kept to a minimum (40 km/h) to reduce the production of dust and avoid collisions with susceptible species such as snakes and tortoises.	Operational Manager	Throughout operation
Erosion Risk		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.	ECO to implement Operational Manager	Throughout operation
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.	ECO to implement Operational Manager	Throughout operation
Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.	ECO to implement Operational Manager	Throughout operation
All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	ECO to implement Operational Manager	Throughout operation
All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	ECO to implement Operational Manager	Throughout operation
Alient Plant Invasion		
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 implement Operational Manager	Throughout operation
Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible	ECO to implement Operational Manager	Throughout operation
Avifauna		
Once the turbines have been constructed, post-construction / operational monitoring should be implemented to compare actual collision rates with predicted collision rates (refer to Section 22).	ECO to implement Operational Manager	Prior to operation
The avifaunal specialist, in consultation with external experts and relevant NGO's such as BLSA, should determine annual mortality thresholds for priority species anticipated to be at risk of collision mortality, prior to the wind farm going operational.	ECO to implement Operational Manager	Prior to operation
If actual collision rates exceed the pre-determined threshold levels, curtailment of turbines should be implemented for high-risk situations.	ECO to implement Operational Manager	Throughout operation
A 150m no-turbine set-back buffer zone (infrastructure is allowed) is required around the escarpment to minimise the risk of collisions for slope soaring species.	ECO to implement Operational Manager	Throughout operation

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Care should be taken not to create habitat for prey species that could draw priority raptors into the area and expose them to collision risk. Rock piles must be removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie).		
Bats		
Once the turbines have been constructed, post-construction / operational monitoring should be implemented (refer to Section 23).	ECO to implement Operational Manager	Prior to operation
Adhere to operational mitigation measures that may be deemed necessary during the operational monitoring assessment, if any is required.	ECO to implement Operational Manager Specialist	Throughout operation
If possible, utilise lights with wavelengths that attract fewer insects (low thermal/infrared signature). Lights should be switched off when not in use or equipped with passive motion sensors.	ECO to implement Operational Manager	Throughout operation
Social		
Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members.	Developer to implement Operational Manager	Throughout operation
Maximise opportunities for local content, procurement and community shareholding.	Developer to implement Operational Manager	Throughout operation
The proponent, in consultation with the ULM and IYLM, should investigate the options for the establishment of a Community Development Trust and the establishment of a visitor centre.	Developer to implement Operational Manager	Pre-operation
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.	Developer to implement Operational Manager	First 5 years of operation
The ULM and IYLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the ULM and IYLM that should be consulted include the Municipal Managers Office, Municipal Manager and Local Economic Development (LED) Manager.	Developer to implement Operational Manager	Throughout operation

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
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.	Developer to implement Operational Manager	Throughout operation
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 Operational Manager	Throughout operation
Implement agreements with affected landowners.	Developer to implement	Prior to operation

10 CUMULATIVE PHASE

10.1 Geology

The likelihood of cumulative impacts is small. Only if other developments (whether wind farms or not) were to occur, using the same access roads and thereby increasing potential soil erosion aspects, would cumulative impacts need to be considered.

10.2 Freshwater and Wetlands

Overall cumulative impact during the construction and operational phases mitigation measures is to reduce residual risk or enhance opportunities by improving the current stormwater and energy dissipation features not currently found along the tracks and roads within the region and installing properly sized culverts with erosion protection measures at the present road / track crossings.

10.3 Flora and Terrestrial Fauna

The current layout has been arrived at through iteration of various layouts and takes account of the sensitive features identified and mapped, as such, the development footprint will minimize the impact on the high sensitivity areas and is considered to represent an acceptable mitigated layout. Further refinement of the layout can occur with turbine micro-siting at the pre-construction phase to minimize impact on local features such as rocky outcrops. There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.

10.4 Avifauna

Cumulative impacts on avifauna are displacement of priority species due to construction activities at the wind development area; mortality of priority species due to electrocution associated with the internal medium voltage MV powerlines; direct mortality of priority species due to collisions with the turbines at the wind development area; displacement of priority species due to dismantling activities at the wind development area; and direct mortality of priority species due to collisions with the internal medium voltage MV lines and the 132kV grid connection powerline. The mitigation measures to reduce residual risk or enhance opportunities is to ensure that all the proposed mitigation measures for the Hartebeesthoek West WEF detailed above must be implemented and all the proposed mitigation measures proposed for the other renewable energy facilities within a 35 km radius should be implemented to reduce the cumulative impact. Developers and operators of the facilities must ensure that these mitigation measures are implemented.

10.4.1 Mitigation Measures

All proposed mitigation measures for Construction, Operational and Decommissioning Impact Phases of the Hartebeesthoek West WEF should be implemented:

- Restrict the construction activities to the construction footprint area.
- Do not allow any access to the remainder of the property during the construction period.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads, and the construction of new roads should be kept to a minimum.
- Implement a 500m no development buffer zone around each of the two pans at FP3 at 31°14'15.02"S 25° 2'44.17"E and FP4 at 31°13'55.42"S 25° 2'50.37"E to protect the pair of Blue Cranes from disturbance.

- The appointed ECO should be trained by an avifaunal specialist to identify the signs that indicate possible breeding by priority species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of such species, and such efforts may include the training of construction staff to identify such species, followed by regular questioning of staff as to the regular whereabouts on site of the species. If any priority species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and the avifaunal specialist will be contacted immediately for further assessment of the situation and instruction on how to proceed.
- The final powerline design and associated electrocution mitigation measures (if necessary) must be approved and signed off by the avifaunal specialist.
- The recommendations of the specialist ecological study must be strictly adhered to.
- Maximum used should be made of existing access roads, and the construction of new roads should be kept to a minimum.
- 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 a rehabilitation specialist.
- Once the turbines have been constructed, post-construction monitoring should be implemented to compare actual collision rates with predicted collision rates.
- The avifaunal specialist, in consultation with external experts and relevant Non-governmental Organisations (NGO's), such as BirdLife South Africa (BLSA), should determine annual mortality thresholds for priority species anticipated to be at risk of collision mortality, prior to the wind farm going operational.
- If actual collision rates exceed the pre-determined threshold levels, curtailment of turbines should be implemented for high-risk situations.
- A 150m no-turbine set-back buffer zone (infrastructure is allowed) is required around the escarpment to minimise the risk of collisions for slope soaring species.
- Care should be taken not to create habitat for prey species that could draw priority raptors into the area and expose them to collision risk. Rock piles must be removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie).
- Restrict the dismantling activities to the footprint area.
- Do not allow any access to the remainder of the property during the dismantling period.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads, and the construction of new roads should be kept to a minimum.

10.5 Bats

Cumulative impacts on bat mortalities due to direct blade collision or barotrauma during foraging on resident and migrating bats can be mitigated by adhering to recommended mitigation measures during the operational phase study; applying and adhering to project-specific mitigations and the sensitivity map during any further turbine layout revisions; avoid placements of turbines in bat sensitive areas and their buffers; lastly the high sensitivity valley areas can serve as commuting corridors for bats in the larger area, potentially lowering the cumulative effects of several WEF's in an area if the valley areas are avoided during turbine placement and are well buffered.

10.6 Visual

Large construction vehicles and equipment during the construction phase of the Hartebeesthoek West WEF will contribute further to the alteration of the natural character of the study area and will also expose a greater number of visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an

unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed Hartebeesthoek West development site on gravel access roads are also expected to result in an increase in dust emissions in the greater area. The increased traffic on these roads and the dust plumes could create a greater visual impact within the greater area and may evoke more negative sentiments from surrounding viewers. Surface disturbance during construction of the Hartebeesthoek West WEF would also result in a greater amount of bare soil being exposed which could result in a greater visual contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the landscape further. Wind blowing over these disturbed areas could result in a greater amount of dust which would have a visual impact. The following should be implemented by all developers in the cumulative region assessed:

- Carefully plan to reduce the construction period.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads, where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed Hartebeesthoek West development site, where possible.
- Ensure that dust suppression techniques are implemented on all access roads.
- Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place.
- Ensure that dust suppression techniques are implemented on all soil stockpiles.
- Temporarily fence-off the construction sites (for the duration of the construction period).
- All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid, where possible.
- It is not realistic to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. This can be approached by making use of certain materials and finishes and by presenting the scheme to I&APs.
- Institute a rigorous planting regime around certain boundaries of the project site, for example, the substations, the buildings, and the N10 and N9 transportation routes.
- Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism (namely sense of place, sense of history, sense of nature, sense of craft and sense of limits).

The Hartebeesthoek West WEF development and its associated infrastructure could exert a visual impact by further altering the visual character of the surrounding area and exposing a greater number of sensitive visual receptor locations to visual impacts. The operation of the Hartebeesthoek West WEF in addition to the other nearby renewable energy developments may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the Hartebeesthoek West WEF development and its associated infrastructure via gravel access roads and are expected to increase dust emissions in the surrounding area in doing so. The increased traffic on the gravel roads and the dust plumes could create a greater visual impact within the surrounding area and may evoke more negative sentiments from surrounding viewers. It should, however, be noted that the existing roads which can be found around the project site also appear to be gravel. As such, the gravel access roads are not expected to contribute significantly to the overall cumulative visual impact. Security and operational lighting at Hartebeesthoek West WEF development and its associated infrastructure could result in a greater amount of light pollution and glare within the surrounding area, which could be a significant annoyance to surrounding viewers.

- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.

- Medium-high visual impact zones should be viewed as zones where the number of turbines should be limited, where possible.
- Light fittings for security at night should reflect the light toward the ground (except for aviation lighting) and prevent light spill.
- The operations and maintenance buildings should not be illuminated at night, if possible.
- Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011 where possible). Bright colours or obvious logos should not be permitted.
- Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).
- The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.
- If required, turbines should be replaced with the same model or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscape made up of diverse colours, textures and patterns (Vissering, 2011).
- As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.
- Bury cables under the ground where possible.
- Ensure that dust suppression techniques are implemented on all access roads.
- Select the alternatives that will have the least impact on visual receptors.

10.7 Heritage

The cumulative impact on heritage is the risk of accumulative damage to the National Estate. Given the lack of information at present, it is difficult to judge the success of mitigation and therefore, the degree of accumulative impact that has taken place. Methods must be developed by heritage authorities, to assess the success of mitigation, within renewable energy projects.

10.8 Social

- The final placement of wind turbines associated with the proposed WEF should be discussed with the affected landowners, and the recommendations of the VIA should be implemented.
- The establishment of a number of renewable energy facilities has the potential to place pressure on local services, specifically medical, education and accommodation. The Northern and Eastern Cape Provincial Government, in consultation with the (Umsobomvu Local Municipality) ULM and Inxuba Yethemba Local Municipality (IYLM) and the proponents involved in the development renewable energy projects in the ULM and IYLM area should consider establishing a Development Forum to coordinate and manage the development and operation of renewable energy projects in the area, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including the capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the ULM and IYLM.
- The establishment of a number of renewable energy facilities in the region will create employment, skills development and training opportunities, creation of downstream business opportunities. The proposed establishment of suitably sited renewable energy facilities within the ULM and IYLM should be supported.

10.9 Wake Effect Analysis

On the 30 November 2022, 3E compiled a wake effect impact analysis to calculate the impact that the Hartebeesthoek West (and East) WEF would have the on the operational Noupoort Wind Farm. The report was based on the combined amended WEF layout and specifications (i.e., 26 wind turbines with 165 m rotor diameter and 124 m hub height). The final combined layout result in a slight percentage increase of the total wake effect impact from 0.25 % of turn over to 0.26 % of turn over (i.e., 0.01 % increase in impact).

11 DECOMMISSIONING PHASE

The objectives of the decommission phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the mitigation measures proposed for the decommissioning phase of the WEF is implemented and conducted appropriately.
- To ensure that the recommended management plans are implemented accordingly.

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.

11.1 Decommissioning and Restoration Plan Recommendations

A Decommissioning and Restoration Plan (DRP) should be considered to ensure that habitat and ecosystem restoration is achievable once the Wind Farm has ceased operating.

According to the *Scottish Natural Heritage Commissioned Report: Research and Guidance on restoration and decommissioning of onshore wind farms*, a logical sequence for decommissioning planning and execution of construction activities were reviewed and some of what are suggested below:

- De-energising the site, usually involves initially high voltage (HV) disconnection in the event of re-energizing of the site followed by low voltage (LV) disconnection of the affected turbines.
- Handing over the site responsibility to an experienced Contractor and management of Operator access and site setup.
- Decommissioning of structures, likely to be the reverse of the installation procedure, such as:
    - Stripping out of turbine internals and removal of transformer;
    - Controlled dismantling of turbines (blades, nacelle, tower);
    - Removal of turbine base and backfilling void;
    - Removal of cables (whole or partial) and making good trenches (throughout);
    - Removal of crane pads (whole or partial) and backfilling/landscaping;
    - Removal of Sub-station and associated buildings (when applicable);
    - Removal of access tracks (whole or partial) and associated water crossings, passing areas etc. Working from end point towards exit point;
    - Reinstating watercourses and /or removing watercourse crossings;
    - Final landscaping (seeding) and making good remaining borrow pits etc;
    - Make good public road junctions, if required;.
    - Providing 'as-built' documentation including residual risks to Landowner and Planning Authority; and
    - Monitoring and maintaining the site to achieve the end-use requirement.

11.1.1 Soil Conservation and Management

Completely removing wind turbine infrastructure is likely to require a rock-based backfill into the voids left behind. Decommissioning plans have proposed options that involve the removal of turbine materials to a depth of approximately 1 m below ground level followed by surface restoration of topsoil. This approach needs to be considered carefully as it may not always be ecologically feasible. Using large quantities of off-site rock or soil for backfill could have detrimental impacts especially if the backfill's chemical composition is significantly different from that found in the natural, baseline (receiving) soil environment of the site. A recommendation would be to avoid using large quantities of backfill that do not match the receiving environment's baseline soil profile.

Other direct and indirect impacts on soil properties that may occur during construction and decommissioning phases that should be avoided include:

- Sealing soil by covering it with impermeable materials that may alter the soil's chemical and biological properties and could have adverse impacts on drainage characteristics;
- Contaminating soil through accidental spillage / use of chemicals;
- Compacting soil with heavy machinery;
- Mixing topsoil with subsoil, resulting in reduced soil quality; and
- Indirect effects on water quality – increase in dissolved organic carbon and presence of suspended soils.

Before any decommissioning and restorative design work takes place, an in-depth assessment of the available soil on site, along with soil-forming resources from the restorative layers should be carried out. It is important to understand a site's soil characteristics and their influence on habitats so that communities that are re-established are likely to sustain themselves in the long run.

Agricultural restoration would need at least a thin layer of topsoil, while semi-natural environments often require low nutrient substrates and woodland restorative planting needs a minimum depth of 1 m of suitable material.

Imported soils should match the chemical and nutrient composition of the receiving soil profile and should be free of invasive and undesired seedlings / propagules. Using imported peat or soils may result in the need for resowing if the material does not contain a viable seed bank of local provenance. Reseeding techniques will inevitably be needed as materials that were side-casted during the initial construction phase will not contain enough viable seeds to regenerate the whole restoration area. Other soil-forming materials can be used in the absence of sufficient topsoil, peat, and appropriate seed bank levels as long as soils and/or soil substitutes are aligned with the site's target ecosystem.

11.1.2 Vegetation Restoration

The objective of habitat restoration (see Section 15 of this EMPr) is to minimize degradation of the ecological resource and promote the re-establishment of a functional ecosystem. Decommissioning plans that involve significant disturbance of habitats (complete removal of infrastructure) require a longer recovery period in environments less resilient to disturbance (peatlands or species-rich grasslands). Habitat restoration techniques must consider the ease that different habitats can be restored and the likely success of this restoration.

11.1.3 Options for End-of-life Infrastructure

Generally, the turbine would be dismantled at ground level and transported away from the site for recycling, reuse, or disposal. The decommissioning of the turbine structure should have a minimal environmental impact. Costs are driven by haulage and craneage charges.

Installed wind turbines consist of four sections: the rotor, nacelle, tower, and foundation. It is important to know what materials were used in the construction of the turbines as this will provide insight into best practices for appropriate disposal methods.

Materials commonly used in the construction of turbines are:

- Rotor – Blades, Blade hub, Nose cone, Resin, fiberglass, cast iron.
- Nacelle – Bed frame, Main shaft, Transformer, Generator, Gearbox, Nacelle cover, Steel, Silica, copper, steel, fiberglass, resin.
- Tower - Steel, Concrete (very uncommon).
- Foundation – Footing, Ferrule, Concrete, iron, steel.

Other material to be decommissioioned are discussed below.

- Transformer - There are limited recycling options, and is therefore recommended to be removed from site for disposal or be used by others. It would be a low cost to the decommissioning plan.
- Crane Pads can be retained, regraded and then covered. Original soils must be managed to be reused for restoration. Costs involved are Low to Medium. Recycling options would be to use on-site as backfilling voids.
- Tracks and roads can be left in situ if suitable and if not hindering on any other risks such as visual, hydrology. For reinstatement, original topsoil and appropriate seed layer must be used.
- Substations can be removed from site and materials can be separated and reused. Cables made from copper material can be recycled offsite.

Turbine foundations consist of reinforced concrete gravity structures or reinforced concrete bases supported on piles. The removal of a base will involve breaking apart the reinforced concrete. The concrete is recommended to be broken into smaller sections with steel cutting equipment, hydraulic breakers, excavators, and dump trucks for their removal. It is suggested that the removal of a concrete base could take a week if only the top layer of 1 meter is removed. Should reinforced concrete be processed on-site to remove steel (for recycling purposes) and create a granular or rubble concrete material, it can be used for further construction (tracks, hardstandings) if appropriate to the site. Processed or unprocessed reinforced concrete can be removed from site and be reused or recycled.

Alternatively, reinforced concrete can under normal circumstances remain *in situ* as an inert material. Concrete is inherently durable unless attacked by soils containing sulphates or low pH and other aggressive agents. The risk of rebar corrosion is low in buried concrete due to the low risk of carbonation and low levels of oxygen. Where ground conditions pose a chemical risk, it is likely that the concrete would have been designed to be resistant to acidic or alkaline conditions. Site-specific risks should be assessed in the DRP as the base has been *in situ* for 15 years.

Retaining the base *in situ* can be considered as there is a relatively low environmental risk associated with reinforced concrete. The noise, ground disturbance, and costs of excavating, processing, and transporting along with associated carbon emissions may create a larger environmental impact than leaving the base *in situ*.

Removing the concrete base without backfilling would leave a sizeable void that could pose a health and safety hazard or an unwanted feature in the visual landscape. The void would need to be filled with appropriate material as discussed in the soil conservation section.

Turbine bases supported on concrete piles are more difficult to remove. Leaving such piles *in situ* should not create an environmental hazard but it may be prone to oxidizing and staining or contamination. This is due to the depth of cover between concrete and reinforcement in the piles may be less than in gravity bases.

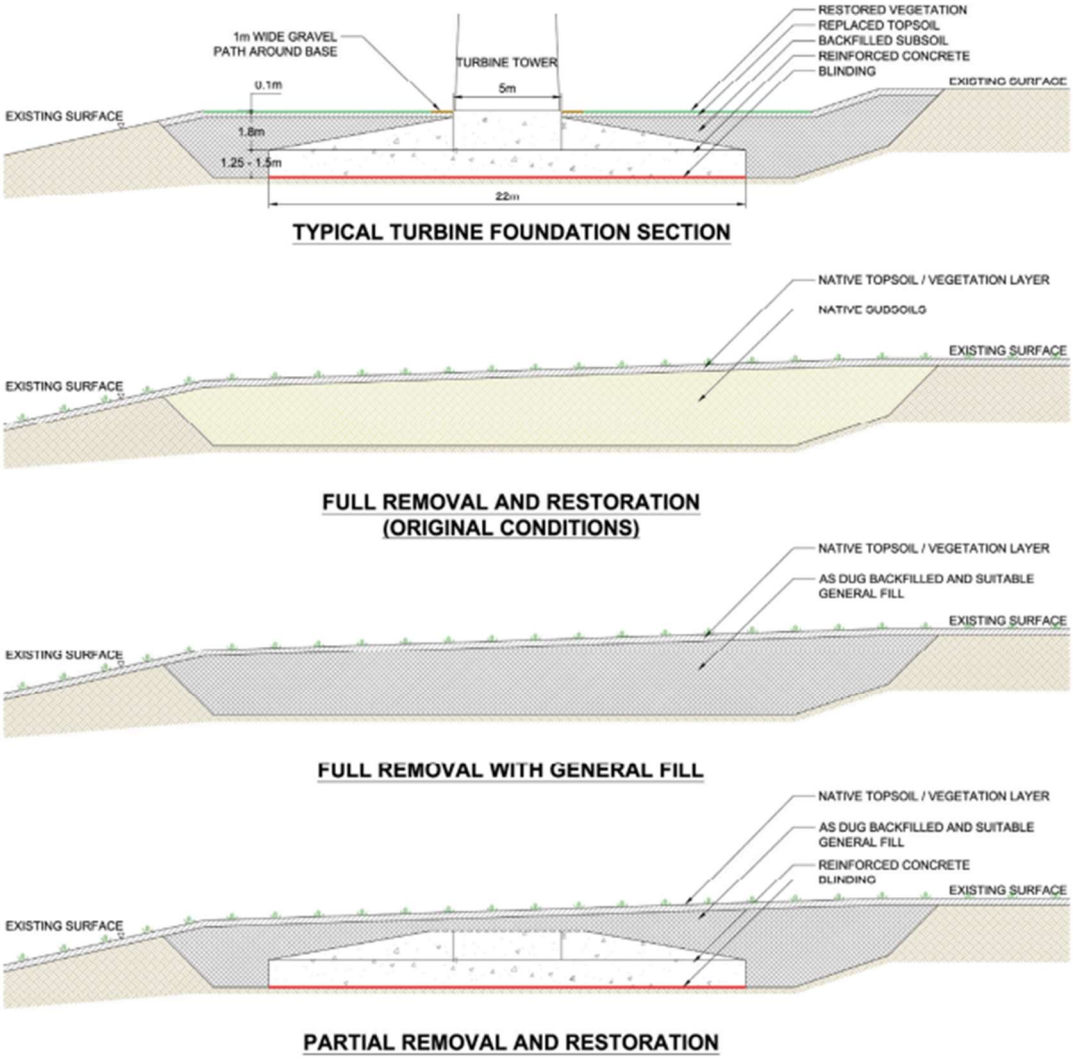


Plate 11-1: Turbine foundation decommissioning alternatives

11.1.4 Reuse of Turbines

Ideally, sending off material to a landfill should be avoided or used as a last resort. There is the option of reusing wind turbine infrastructure where feasibly possible. For developing countries, buying second-hand wind turbines serve as an opportunity to gain experience with renewable energy and allow for profit from technology transfer with low capital expenditure. Wind turbines could be sold, or their materials (mainly comprised of steel, copper, and electronics) can be recycled or reused where possible.

Turbine blades are slightly more difficult to recycle as they're made primarily from fiberglass, a composite material. Cutting the blades into smaller, manageable sizes on site is achievable, but transporting the materials off-site is costly. There are limited recycling options for composite materials. Most recycling activities for composite materials are limited to down cycling (converting waste into products of lesser quality or reduced functionality.

11.2 Potential Decommissioing Phase Impacts

Recommended persons as provided in Table 11.1 below should take responsibility for the implementation and monitoring to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

Table 11-1: Decommissioning Phase Impact Management

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Freshwater and Wetlands		
Any stormwater within the site must be handled in a suitable manner, i.e., trap sediments, and reduce flow velocities.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Terrestrial Ecology		
Any fauna directly threatened by the decommissioning activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All heavy machinery and vehicles should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
No excavated trenches or holes should be left open for extended periods as fauna may fall in and become trapped.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the landowners concerned.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any roads that will not be rehabilitated should have appropriate erosion and runoff control features in place.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any erosion or runoff of sediment deposition should be monitored for at least two years following decommission and appropriate steps should be taken to prevent erosion from continuing.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning Two years post decommission

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Site access must be controlled and no unauthorised persons are to be allowed onto the site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
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 implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Avifauna		
Restrict the dismantling activities to the footprint area.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Measures to control noise and dust should be applied according to current best practice in the industry.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Maximum use should be made of existing access roads, and the construction of new roads should be kept to a minimum.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Social		
The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
All structures and infrastructure associated with the proposed facility/ies should be dismantled and transported off-site on decommissioning.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning
The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning
Traffic		
Produce a Traffic Management Plan which must include the following mitigation measures: • The arrival and departure of vehicles should be staggered during off- peak periods to have a distributed effect over low volume traffic periods. • All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996. • The Project Manager and Site Safety Officer during decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen. • Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition. • Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits. • Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning

12 ALIEN INVASIVE MANAGEMENT PLAN

12.1 Purpose of the Alien Invasive Management Plan

The purpose of the 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 Hartebeesthoek West WEF. 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 and 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.

12.2 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) (CARA), 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 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.

12.3 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.

12.3.1 Wetlands, drainage lines and other mesic areas

There are a number of drainage lines at the site. 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 must be minimized and these areas must be checked for alien species more than the surrounding landscape.

12.3.2 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.

12.3.3 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.

12.4 General Clearing and Guidance Principles

Alien control programs are long-term management projects and must include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site must be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan must then form part of the pre-construction reporting requirements for the site.

The plan must include a map showing the alien density & indicating dominant alien species in each area.

- Lighter infested areas must be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally must 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 must be monitored and documented to keep track of which areas are due for follow-up clearing.

12.5 Clearing Methods

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

12.6 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 must 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 must 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 must be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles must be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures must also be followed regarding the storage, handling and disposal of herbicides.

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

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

12.7 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 must be undertaken as the work front progresses – mass clearing must 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 must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	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 must not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose must be brought onto site. Brush from cleared areas must 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 building sand or dirty earth-moving equipment.) Stockpiles must be checked regularly and any weeds emerging from material stockpiles must be removed.	Weekly
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 must adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly

Construction Phase Action	Frequency
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 must remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

12.7.1 Monitoring Actions - Construction Phase

The following monitoring actions must 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

12.8 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 must be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified must 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 must take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation must 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, must 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 must be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species must be used.	When necessary

12.8.1 Monitoring Actions - Operational Phase

The following monitoring actions must be implemented during the operation 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

12.9 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

12.9.1 Monitoring Actions - Decommissioning Phase

The following monitoring and evaluation actions must 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

13 PLANT RESCUE AND PROTECTION PLAN

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. The preconstruction walk-through of the site has refined the list

of species identified for search and rescue, as well as locate such species prior to construction (see Appendix D).

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.

13.1 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.

13.2 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.

13.3 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 must commence during early spring after the first rains.

13.4 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 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.

14 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 EMPrs 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; and
- 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 EMPr-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 must 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 must 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.

14.1 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 must 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.

14.2 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 must 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.

14.3 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 plan.
- 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.

14.4 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 must preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix must 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.

14.5 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 must be re-introduced, seed must 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 must 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 must 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); and
- Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) must be sown or planted.

14.6 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 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 must 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, and
  - 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.

14.7 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) must 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 must 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.

15 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 connections and associated infrastructure has 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 must be 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 must 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 must be strictly controlled;
- All visitors and contractors must be required to sign-in;
- Signage at the entrance must indicate that disturbance to fauna and flora is strictly prohibited.

The following activities must 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 road; and
- No interfering with livestock.

15.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse. Parts of the farm are used for cultivation of planted pasture and small grain grazing – all used only for grazing. There is no small grain harvested on the farm. 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 must be adhered to:

- A grazing management plan for the site must be developed in cooperation with Agricultural Extension services.
- The stocking rate applied must be within the recommended limits as identified by the Department of Agriculture.
- Livestock must 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 must 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.

16 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 development. 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. Operations, maintenance and decommissioning phase traffic is expected to be insignificant, except where a major WEF component (i.e. replace damaged turbine blade) could be required.

The development must be accessible to passenger cars, buses, trucks and abnormal multi-vehicle combinations which will be delivering WT components. Access to the site needs to be safe and practical to minimise the risk of pedestrian and vehicle accidents through:

- The provision of adequate traffic control; and
- Clear visibility by ensuring sufficient stopping sight distances and sufficient markings and warnings signs.

The traffic management plan to be implemented during construction and decommissioning should consist of the following recommended mitigation measures:

- The arrival and departure of construction vehicles should be staggered during off- peak periods to have a distributed effect over low volume traffic periods.
- All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996.
- The Contractor and Site Safety Officer / ESO, during construction and decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen.
- Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition.
- Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits.
- Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.
- A comprehensive assessment of the entire route is recommended on award of the project.
- Prohibit WEF equipment and materials transportation at night, during the school December holiday period, on public holidays, during festivals or other special events.

Actions to be implemented by the Contractor and the Developer:

- 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 / ESO:

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

17 TRANSPORTATION MANAGEMENT PLAN

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

The following actions must 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 must be carried out by the ECO / ESO:

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

As part of the Traffic Management Study that was undertaken for the development, the following regarding transportation management must be considered and implemented:

- Transport requirements for the WEF project will require the use of abnormal load vehicles as stipulated in the TRH 11, especially in the construction phase of the project for the delivery of construction materials and turbine components. Very little to no special transport will be required during the remainder of the development phases as standard transport will be used.
- All WT components are considered to be abnormal loads, either through length, weight or height, usually comprising of 3 tower sections, 1 hub, 1 nacelle and 3 blades. These require different truck / trailer combinations and configurations to be transported. These issues will be investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the permit issuing authorities. The heaviest component of a wind turbine is the nacelle (approximately 67 to 85 tons depending on manufacturer and design of the unit). Combined with road-based transport, it has a total vehicle mass of approximately 130 000 kg (for the 85 ton unit). Thus, route clearances and permits will be required for transporting the nacelle by road based transport.
- Blades are the longest component, ranging between 45 – 75 m, and need to be transported on a specially imported extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can be transported individually, in pairs or in three's although different manufacturers have different methods of packaging and transporting the blades. Where required, existing public roads may need to be upgraded along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components. The national roads on the potential national access routes are generally of high standard and many of the structures have been assessed for load bearing capacity and height clearance in the past. Turbine supplier/s or the contractor selected for implementation would be responsible for the transportation of wind turbine components to site.

17.1 Permit requirements

In transportation of loads the following guidelines are available. According to the TRH 11, the expected load dimensions are classified as abnormal load, therefore an exemption permit for each province that the load has to transit is required.

Provision for the type of abnormal loads in this development is made in the National Road Transport Act (NRTA), and specifically in Section 81 of the NRTA, which reads as follows:

"Vehicle and load may be exempted from provisions of Act

An MEC may, subject to such conditions an upon payment of such fees or charges as he or she may determine, authorise in writing, either generally or specifically, the operation on a public road of a vehicle which does not comply with the provisions of this Act or the conveyance on a public road of passengers or any load otherwise that in accordance with the provisions of this Act."

When the movement of an abnormal load is considered to be in the economic and/or social interest of the country, an exemption permit may be issued to allow a vehicle(s) transporting such an abnormal load to operate on a public road for a limited period. The fundamental principles guiding this process are:

- An exemption permit for an abnormal load will only be considered for an indivisible load, abnormal in dimension and/or mass, where there is no possibility of transporting the load in a legal manner.
- The risks to other users must be reduced to a level equivalent to what it would be without the presence of the abnormal vehicle on the road; and
- The conditions imposed must take the economic and/or social interest of the country and public at large into account.

17.2 Types of Abnormalities

The WEF is anticipated to carry loads that are considered to be indivisible, can be abnormal either dimensionally or abnormal in mass or abnormal both dimensionally and in mass.

The following is the Legally Permissible Maximum Dimensions / Mass:

Length- Truck & Semi-trailer (Tri-Axle) Overall length of combination (Including load projections) -18.50m. Superlink (6m + 12m trailers) Overall length of combination (No load projections) –22.00m.

Width- 2.60 m.

Height- 4.30 m measured from the ground. Height of conventional trailer is 1.60m from ground to trailer deck, therefore permissible height of load is 2.70m.

Weight- 13.50m Tri-Axle 28 Ton / 15.00m Tri-Axle 30 Ton. Superlink 34 Ton gross (6.00m –10 / 12 Ton & 12m –24 / 22 Ton)

The WEF components are classified as an Abnormal Load and will necessitate the application to the Department of Transport and Public Works for a permit authorising the conveyance of said load.

With the required permits in place, the following escort vehicles (whether it is the clients own escort vehicles or provincial traffic officer) will be necessary to escort the transportation of abnormal loads. The anticipated escort vehicles are presented in Table 18.1.

It must be noted Loads with a height of 4.70m measured from the ground require –1 x Own Escort vehicle. For loads of 5.50m + high Telkom & Eskom Clearances are required for the lifting of overhead lines. Upon final selection of WT models to be used, the exact amount of escort vehicles can be determined.

Table 17-1: Escort Vehicles

	Details	Escort Vehicles
Tower	Length: 150 m	3 Tower sections/WT 2 x Provincial Traffic Escorts (subject to width of load)
Rotor	Blade Length: 75 m Hub	3 Blades/WT Connected to 1 Hub/WT 2 x Provincial Traffic Escorts (subject to width of load)

17.3 SANRAL Consultation

Consultation took place with SANRAL on 09 January 2018. It was established that:

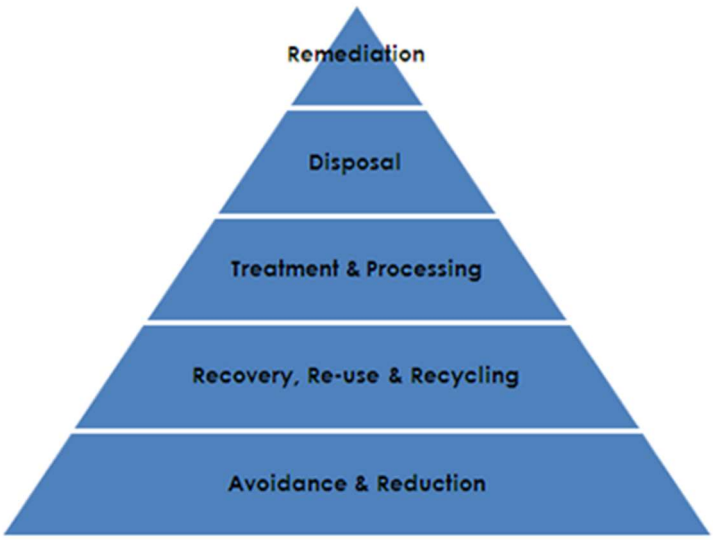
- SANRAL's Western Region (head office in Cape Town, Western Cape) is responsible for the section of the N9 where the access points are proposed (accesses are located in the Northern Cape). The project manager of this section of the N9 is Mr Deriek Wilson - 021 957 4600.
- SANRAL's Southern Region (head office in Port Elizabeth, Eastern Cape) will be responsible for the remainder of the N9 route to/from the site and Port. The project manager for the N9 between Graaff-Reinet and Carlton Heights is Mr Danford Adams - 041 398 3200.
- The TIA, a plan indicating existing intersections and layouts as well as planned intersections and proposed layouts produced by the Developer must be submitted to SANRAL's statutory control section for approval before construction. SANRAL may then request additional information as required
    - Consultation will take place during the public participation process of this final EMPr and development layout.

18 WASTE MANAGEMENT PLAN

A waste management plan (WMP) is important to ensure a safe and healthy environment and that sustainable waste management and procedures are followed throughout the lifecycle of the project. The DFFE promulgated the National Environmental Management: Waste Act 59 of 2008 (Waste Act) and in 2010 developed the National Waste Management Strategy (NWMS). The WMP provides recommended measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes recommendations for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste generated from the project activities on site.

The introduction of an internationally best known practise in waste management, the Waste hierarchy (Plate 18.1 below) is one of the best mechanisms that came into effect with the promulgation of the waste act. The waste act promotes the exercising of the duty of care and the implementation of the waste hierarchy while protecting the environment.

Plate 18-1: Waste Hierarchy- National Waste Management Strategy 2010



(Source: https://www.dffe.gov.za/projectsprogrammes/workingonwaste)

18.1 Construction Phase Waste Management

A method statement to detail the specific (hazardous) waste management practices should be prepared by the Contractor prior to the commencement of activities.

General Waste Management

- Construction methods and materials should be carefully considered and implemented in view of waste reduction, re-use, and recycling opportunities.
- The ESO / ECO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.
- The ESO / ECO must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste.
- A dedicated waste area must be established on site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- Waste collection bins and hazardous waste containers must be provided by the contractor and placed at strategic locations around the site for the storage of organic, recyclable and hazardous waste.
- The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- All waste removed from site must be done by a registered / licensed subcontractor, who must supply information regarding how waste recycling / disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.
- Waste must be stored in designated containers and not on the ground.
- Waste generated on site must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process, however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.

Waste Management Practices

- Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- Waste manifests and waste acceptance approvals (i.e. receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- It is the responsibility of the ESO / ECO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors. Signage / colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Septic tanks and portable toilets must be maintained regularly and monitored by the ESO / ECO. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- Hazardous waste must be stored within a bunded area constructed according to SABS requirements, and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a

storage facility should be at least 120% of the net capacity of the largest tank and should also take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.
- Interconnected tanks should be treated as a single tank of equivalent total volume for the purposes of the bund design criteria.
- Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls. If any leaks occur in the bund, these must be removed immediately.
- The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable stormwater system separating clean and contaminated stormwater.
- Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil / water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- No mixing of hazardous and general waste is allowed.

The success of the Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards and provide clear evidence of the success or otherwise of the plan.

- Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
- Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.
- Training and awareness regarding waste management shall be provided to all employees and contractors.

18.2 Operation Phase Waste Management

Operation phase activities will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site or other facilities.

Waste Management Practices

- The Operational Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
- Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
- Recyclable waste must be removed from the waste stream and stored separately.
- All waste must be stored in appropriate temporary storage containers (separated between different operation wastes, and contaminated or wet waste).
- Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- Waste generated on site must be removed on a regular basis throughout the operation phase.

- Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

Waste Management Practices

Records must be kept of the volumes / mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes / mass of the different waste streams collected;
- Monthly volumes / mass of the waste that is disposed of at a landfill site;
- Monthly volumes / mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must from part of the ESO's reports to the ECO on a monthly basis.

19 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 (i.e. gabions etc);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (i.e. 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;
- Any run-off from the BESS area must be controlled and managed before entering any stormwater channel; and
- Prevent surface run-off from areas of potential contamination.

20 EROSION MANAGEMENT PLAN

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.

20.1 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.

20.2 Background

20.2.1 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.

20.2.2 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.

20.2.3 Erosion and Sediment Control Principles

The goals of erosion and sediment control during and after construction at the site must 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.

20.2.4 On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and must not operate independently, but must rather be seen as complementary activities within the broader environmental management of the site and must 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 must 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 must be minimized. Allied to this the fact that topsoil does not store well and must 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 must not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

20.3 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 must 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 must be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts must be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems must ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

20.4 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will lead 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 must 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.

20.4.1 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 must apply.

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

20.5 Monitoring Requirements

20.5.1 Construction Phase

The following monitoring actions must 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

20.5.2 Operational Phase

The following monitoring actions must 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	Map of erosion problem areas	Quarterly

Monitoring Action	Indicator	Timeframe
or collected from upslope onto downslope areas		
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

21 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act (Act 101 of 1998) 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
- Personnel within the facility
- Infrastructure such as transmission lines

21.1.1 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 must 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 must be implemented.

22 AVIFAUNA MANAGEMENT AND MONITORING PLAN

The avifauna monitoring and management plan must be implemented during all phases of the facility. This plan must be drafted by a suitably qualified avifauna specialist.

Impact	Mitigation/Management Objectives and Outcomes	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Design Phase					
Avifauna: Mortality due to collisions with the turbines					
Mortality of priority avifauna due to collisions with the wind turbines	Prevent mortality and displacement of priority avifauna	The results of the pre-construction monitoring must guide the lay-out of the turbines, especially as far as proposed no-turbine zones are concerned. No turbines must be constructed in the buffer zones which were identified based on the results of the pre-construction monitoring, with a specific view to limiting the risk of collisions and disturbance to a variety of birds, including several Red Data species. All turbines must have 1/3 of one blade painted in signal red as a pre-cautionary measure against turbine collisions if feasible.	Design the facility with 3.4km turbine exclusion zones buffers around Verreaux's Eagle nests to mitigate against turbine collisions. Other infrastructure is allowed Design the facility with 1.5km all infrastructure exclusion zones around Verreaux's Eagle nests to mitigate against disturbance. Design the facility with 1/3 of one blade painted in signal red on every turbine.	Once-off during the planning phase.	Project Developer
Avifauna: Mortality due to electrocution					
Electrocution of raptors on the internal 33kV poles	Prevent electrocution mortality	Use underground cabling as much as is practically possible. Where the use of overhead lines is unavoidable due to technical reasons, the Avifaunal Specialist must be consulted to ensure that a raptor friendly pole design is used.	Design the facility with underground cabling. Consult with Avifaunal Specialist during the design phase of the overhead lines.	Once-off during the planning phase.	Project Developer
Construction Phase					
Avifauna: Displacement due to disturbance					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of priority avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	A site-specific Construction EMPr (CEMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and must apply good environmental practice during construction. The CEMPr must specifically include the following: No off-road driving. Maximum use of existing roads. Measures to control noise and dust according to latest best practice. Restricted access to the rest of the property. Strict application of all recommendations in the botanical specialist report pertaining to the limitation and rehabilitation of the footprint.	Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. Ensure that construction personnel are made aware of the impacts relating to off-road driving. Construction access roads must be demarcated clearly. Undertake site inspections to verify. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance. Appoint avifaunal specialist to conduct walk-through and inspections.	Daily Monthly Monthly Monthly Monthly Once-off	Contractor and ECO Contractor and ECO Contractor and ECO Contractor and ECO Contractor and ECO Project Developer
Avifauna: Mortality due to collisions with the turbines					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Mortality of priority avifauna due to collisions with the wind turbines	Prevent mortality of priority avifauna	Rock piles must be removed from site or covered with topsoil to prevent them from becoming habitat for Rock Hyrax (Dassie)*Procavia capensis.*	Regular inspections must be conducted by the ECO to ensure that rock piles are removed from site or covered with topsoil.	Weekly	Contractor and ECO
Avifauna: Mortality due to collisions on the 33kV and 132kV networks					
Bird collisions on the overhead sections of the internal 33kV cables and the 132kV overhead lines	Prevention of collision mortality on the overhead sections of the 33kV internal cable network and the 132kV overhead lines.	Bird flight diverters must be installed on all the overhead sections of the 33kV lines as per the instructions of the specialist. The avifaunal specialist must indicate all spans that need to be marked with bird flight diverters on 132kV overhead lines as soon as the pole positions have been finalised.	Install bird flight diverters	Once off.	Contractor and CEO
Operational Phase					
Avifauna: Displacement due to habitat transformation					
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the wind turbines and associated infrastructure.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented by an appropriately qualified rehabilitation specialist, according to the recommendations of the biodiversity specialist study.	1. Follow the approved Habitat Restoration Plan (HRP) once it is approved. 2. Monitor rehabilitation via site audits and site inspections to ensure compliance. Record and report any non-compliance. 3. Any clearing of stands of alien trees on site should be approved first by the avifaunal specialist.	1. Appointment of rehabilitation specialist to develop Habitat Restoration Plan (HRP). 2. Site inspections to monitor progress of HRP. Appoint avifaunal specialist if need be.	1. Once-off 2. Once a year 3. Ad hoc	1. Operations Manager 2. SHE Manager 3. Operations Manager
Avifauna: Mortality due to collisions with the wind turbines					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Bird collisions with the wind turbines	Prevention of collision mortality on the wind turbines.	Formal live-bird monitoring and carcass searches to be implemented at the start of the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015), to assess collision rates. The exact time when operational monitoring is to commence, will depend on the construction schedule, and must commence when the first turbines start operating. The Best Practice Guidelines require that, as an absolute minimum, operational monitoring is to be undertaken for the first two (preferably three) years of operation, and then repeated again in year 5, and again every five years thereafter for the operational lifetime of the facility. It is recommended that suitable pro-active mitigation i.e. Shutdown on Demand (SDoD) be implemented at all turbines up to 5.2km from a Verreaux's Eagle nest, once the wind farm commences with operations, to reduce the risk of collisions of Verreaux's Eagles. If estimated annual collision rates indicate unacceptable mortality levels of priority species, i.e., if it exceeds mortality thresholds as pre-determined by the avifaunal specialist in consultation with BLSA and other avifaunal specialists, additional measures will have to be implemented e.g.	Implement pro-active mitigation measures within the 5.2km zone around Verreaux's Eagle nests. Appoint Avifaunal Specialist to compile operational monitoring plan, including live bird monitoring and carcass searches. Implement operational monitoring plan. Appoint avifaunal specialist to compile quarterly and annual progress reports detailing the results of the operational monitoring and progress with any recommended mitigation measures. Implement reactive mitigation measures beyond the 5.2km zone around Verreaux's Eagle nests.	Once-off Annually Years 1,2, 5 and every five years after that for the duration of the operational lifetime of the facility. Annually As and when required	Operations Manager Operations Manager Operations Manager Operations Manager Operations manager

Impact	Mitigation/Management Objectives and Outcomes	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		blade painting and/or Shutdown on Demand may need to be expanded beyond the 5.2km zone around Verreaux's Eagle nests.			
Decommissioning Phase					
Avifauna: Displacement due to disturbance associated with the dismantling activities					
The noise and movement associated with the de-commissioning activities at the WEF footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the EMPr.	A site-specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the EMPr and must apply good environmental practice during construction. The EMPr must specifically include the following: No off-road driving. Maximum use of existing roads. Measures to control noise and dust according to latest best practice. Restricted access to the rest of the property. Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	Implementation of the EMPr. Oversee activities to ensure that the EMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. Ensure that construction personnel are made aware of the impacts relating to off-road driving. Access roads must be demarcated clearly. Undertake site inspections to verify. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. Ensure that the footprint area is demarcated and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	On a daily basis Weekly Weekly Weekly Weekly	Contractor and ECO Contractor and ECO Contractor and ECO Contractor and ECO Contractor and ECO

23 BAT MANAGEMENT AND MONITORING PLAN

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favourable to bats.

A basic "6 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is structured as follows:

Level of Mitigation	Description for Level of Mitigation
Level 1	No curtailment (free-wheeling is unhindered below manufacturer's cut in speed so all momentum is retained, thus normal operation).
Level 2	Partial feathering (45-degree angle) of blades below manufacturer's cut-in speed in order to allow the free-wheeling blades half the speed it would have had without feathering (some momentum is retained below the cut in speed).
Level 3	Ninety degree feathering of blades below manufacturer's cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.
Level 4	Ninety degree feathering of blades below manufacturer's cut-in speed, with partial feathering (45-degree angle) between the manufacturers' cut-in speed and mitigation cut-in conditions.
Level 5	Ninety degree feathering of blades below mitigation cut in conditions.
Level 6	Ninety degree feathering throughout the entire night.

It is recommended that curtailment be applied from the start of operation at Level 3 on all turbines for every night of the year from dusk until dawn.

Should robust and scientifically defendable data gathered during the operational study phase reveal higher bat mortalities than currently anticipated, the mitigations in Table 23.1 should be applied to the turbines identified as causing the highest impacts. Such curtailment specified in Table 23.1 will have to be at a maximum of Level 5. The turbine layout avoids all High and Moderate bat sensitivities and their buffers.

The Table 23.1 below is based on the passive data collected. They infer mitigation be applied (only when needed as described above) during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing simultaneously, considering conditions in which 80% of bat activity occurred (normalised data). Bat activity at 50 m height were used, with wind speed data at 50 m and temperature data at 37.5 m.

Table 23-1: The periods and weather conditions for implementation of mitigation.

	Terms of mitigation implementation
Peak activity (times to implement curtailment/ mitigation)	1 October – 15 November; sunset – 20:30
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 4.5m/s and simultaneously Temperature above 11°C
Peak activity (times to implement curtailment/ mitigation)	15 February – 31 March; sunset – 04:00

	Terms of mitigation implementation
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 5m/s and simultaneously Temperature above 14°C

24 NOISE MANANGEMENT PLAN

Environmental Noise Measurement can be divided into two distinct categories, namely:

- Passive measuring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active measuring – the measurement of noise levels at identified locations.

No active environmental noise monitoring is recommended due to the low significance for a noise impact to develop. However, should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. Should a noise complaint be registered it is recommended that a noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

24.1 Measurement Localities and Procedures

24.1.1 Measurement Localities

No routine noise measurements or locations are recommended. Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument must be deployed at a control point away from the potential noise source during the measurement period.

24.1.2 Measurement Frequencies

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

24.1.3 Measurement Procedures

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (06:00 – 22:00) and night-time (22:00 – 06:00) period.

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

24.2 Relevant Standard for Noise Measurements

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. It should be noted that the SANS standard also refers to a number of other standards.

24.3 Data Capture Protocols

24.3.1 Measurement Technique

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008.

24.3.2 Variables to analyse

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Noise levels should be co-ordinated with the 10-m wind speed. Spectral frequencies should also be measured to define the potential origin of noise.

24.3.3 Database Entry and Backup

Data must be stored unmodified in the electronic file saved from the instrument. This file can be opened to extract the data to a spread sheet system to allow the processing of the data and to illustrate the data graphically. Data and information should be safeguarded from accidental deletion or corruption.

24.3.4 Feedback to Receptor

A measurement report must be compiled considering the requirements of the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. The facility must provide feedback to the potential noise-sensitive receptors using the channels and forums established in the area to allow interaction with stakeholders, alternatively in a written report.

24.4 Standard Operating Procedures for Registering a Complaint

When a noise complaint is registered, the following information must be obtained:

- Full details (names, contact numbers, location) of the complainant;
- Date and approximate time when this non-compliance occurred;
- Description of the noise or event; and
- Description of the conditions prevalent during the event (if possible).

25 HERITAGE MANAGEMENT PLAN

The purpose of this heritage management plan (HMP) is to provide a framework, under the EMPr, for the management of heritage resources during the construction, operation and decommissioning of the Hartebeesthoek West WEF.

The objective of the HMP is to put in place clear and practical management actions to ensure that heritage resources within the WEF development are protected and conserved and, where they occur, impacts to these resources are appropriately managed and mitigated.

The HMP identifies the below:

- What heritage resources require management;
- Who will carry out the management of heritage resources;

- Appropriate management and mitigation actions to be implemented to ensure that heritage resources are not negatively impacted during the construction, operation and decommissioning of the WEF; and
- Procedures and processes to follow in the event of negative impact to previously identified or new discovered heritage resources during the construction, operation and decommissioning of the WEF.

25.1 Heritage Resources Requiring Management

The known heritage resources within the Hartebeesthoek West WEF identified in the HIA and the pre-construction walkdown report are listed in Appendix E and consist of a number of packed stone structures and some ephemeral Middle Stone Age (MSA) and Later Stone Age (LSA) lithic scatters.

These heritage sites and materials are protected by the National Heritage Resources Act (NHRA) (25 of 1999) which provides protection for various categories of heritage resource from unauthorised disturbance, damage, or destruction, thereby ensuring their protection and preservation for the future.

The identified heritage resources within the Hartebeesthoek West WEF have been graded, in terms of the provisions of section 3 of the NHRA and the gradings for each site are shown in Appendix E. Grading provides an indication of the significance and heritage value of a heritage resource and, in the context of a development such as the Hartebeesthoek West WEF, is key to the management of such resources.

25.2 Responsibility for the Management of Heritage Resources

The Hartebeesthoek West WEF straddles the provincial border between the Eastern and Northern Cape and therefore, falls under the jurisdiction of both the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) and the Northern Cape PHRA.

However, the management of archaeological resources in both the Eastern and Northern Cape is currently undertaken by SAHRA, on behalf of the two provincial agencies. Any management of heritage resources within the Eastern and Northern Cape must, therefore, follow the prescripts of the NHRA and the processes established by SAHRA.

The contact details for NCHRA and SAHRA are:

Northern Cape Heritage Resources Authority (NCHRA)		
Contact Person	Mr Ratha Andrew Timothy	
Tel	+27 53 833 1435	
Email	rtimothy@nbkb.org.za	
NCHRA Website	https://www.nbkb.org.za/	
South African Heritage Resources Agency (SAHRA)		
Contact Person	Ms Natasha Higgitt	Mr P Hine
Tel	021 4624502	
Email	nhiggit@sahra.org.za	phine@sahra.org.za
SAHRA Website	www.sahra.org.za	

The ultimate responsibility for ensuring that heritage resources within the boundaries of the WEF are appropriately protected and managed during construction, operation and decommissioning rests with the Developer, Hartebeesthoek Wind Power (Pty) Ltd.

In terms of the organisational structure set out in this EMPr, a Contractor, ESO and ECO will be appointed to monitor the project compliance with the EMPr and conditions of the environmental authorisation.

The ESO is expected to be in constant liaison with contractors and WEF staff will be the key person responsible for ensuring the effective day to day management of heritage resources for the project. Based on the responsibilities set out in the EMPr, therefore, in respect of heritage resources the ESO will be expected to:

- Monitor, on a daily basis, the implementation of and compliance with the heritage management specifications and mitigation measures set out in the EMPr;
- Keep a register of compliance / non-compliance with the heritage management specifications;
- Identify and assess previously unforeseen, actual or potential impacts on heritage resources; and
- Ensure that a brief monthly heritage management monitoring report is submitted to the ECO.

25.2.1 Potential Impacts to the identified Heritage Resources: Construction, Operational and Decommissioning Phases

The final layout of the WEF does not impact any recorded archaeological heritage resources and no site-specific archaeological mitigation measures have thus been recommended.

However, the following general measures must be implemented to ensure that there are no negative impacts to heritage resources during the various phases of the development:

- Currently unidentified archaeological sites, artefacts and structures may be present within the Hartebeesthoek West WEF and may be subject to impacts arising from activities associated with the construction, operation and decommissioning of the WEF.
- In the unlikely event that archaeological material, rock art or rock engravings or historical structures are encountered during the construction of the WEF, work must cease in the vicinity, and they must be cordoned off and left *in situ*. SAHRA must be informed of the discovery and a suitably qualified archaeologist must be called in to investigate the occurrence so that a decision can be made about how to deal with it.
- The identified stone-built structures and any others encountered within the WEF must be protected from vandalism or damage and no stone may be robbed from such structures.
- In the event that human remains are uncovered during the construction of the WEF, the Contractor must immediately stop work in that area and notify the ECO and/ or EO who must ensure that the remains are made secure and left in situ. The project archaeologist and SAHRA must immediately be informed of the find so that a decision can be made about how to mitigate the remains. This may require inspection by the archaeologist to determine whether mitigation should take place and what form that mitigation should take. An application to SAHRA for an emergency permit for the archaeologist to excavate and recover the remains may also be required.

25.2.1.1 Staff and Contractor Awareness

The ESO must ensure that the Contractor(s) and all site staff are made aware of the heritage resources on the site, the mitigation measures set out above, and the steps to take of human remains or new archaeological material is encountered on site.

This information should be presented in the site induction programme for project staff and in any refresher programmes that may be occur.

25.2.2Revision of the HMP

This HMP included in the EMPr is a living document that can and must be reviewed and updated to reflect any changes to the heritage information for the site or the management protocols set out above.

The HMP must be revised every five (5) years, or more regularly should circumstances require it.

26 FOSSIL FIND PROTOCOL

The following Monitoring Programme for Palaeontology is only required if fossils are seen on the surface and when excavations commence.

- When excavations begin the rocks must be given a cursory inspection by the ESO or contractor. Any fossiliferous material (plants, insects, bone, trace fossils) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
- Photographs of similar fossil plants must be provided to the ESO and ECO to assist in recognizing the fossil plants in the shales and mudstones. This information must be built into the EMPrs training and awareness plan and procedures.
- Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
- If there is any possible fossil material found, a qualified palaeontologist should be sub-contracted and visit the site to inspect the selected material and check the dumps where feasible.
- Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
- If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
- If no fossils are found and the excavations have finished then no further monitoring is required.

27 FUEL STORAGE MEASURES

27.1 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.

27.2 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.); and
- All hazardous waste should be collected by a licensed service provider and transported to a licensed disposal facility.

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 must ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees must understand the chemical and process hazards
- Facilities must 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 made aware and are required to 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".

Environmental Aspect	Action or Measure
	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.
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.
	Should more than 100m^3 of general waste and/or or more than 80m^3 of hazardous waste be stored at the proposed WEF for a period exceeding 90 days, the applicant will need to register in terms of, and adhere to, the NEM: WA National Norms and Standards for the Storage of Waste promulgated in GN No. 926 of 29 November 2013.
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

28 CONCLUSION

In terms of the National Environmental Management Act 107 of 1998, as amended, 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.

Although all foreseeable actions and potential mitigation measures and management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Hartebeesthoek West WEF. The EMPr could thus change daily, and if managed correctly lead to successful construction and operational phases of the development.

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.