

Draft Environmental
Management Programme
(EMPr)

Kokerboom 3 Wind Energy Facility

**Business Venture Investments
No 2105 (Pty)Ltd**

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


Kokerboom 3 WEF

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Business Venture Investments No 2105
(Pty) Ltd

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ABBREVIATIONS

BBBEE	Broad Based Black Economic Empowerment
BFD	Bird Flight Diverters
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DEA&DP	Department of Environmental Affairs and Development Planning
DAEARDL	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform ¹
DFFE	Department of Forestry, Fisheries and Environment
DM	District Municipality
DHSWS	Department of Human Settlements and Water ad Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
EO	Environmental Officer
ESA	Ecological Support Area
GPS	Geographical Positioning System
LM	Local Municipality
MTS	Main Transmission Substation
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act 25 of 1999)
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act (Act 36 of 1998)
OHSA	Occupational Health and Safety Act (No. 85 of 1998)
SAHRA	South African Heritage Resources Authority
SANBI	South African National Biodiversity Institute
SIBIS	SANBI Integrated Biodiversity Information System
WEF	Wind Energy Facility
WULA	Water Use Licence Application

¹ The Department of Environment and Nature conservation had merged with the Department of Agriculture, Rural Development and Land Reform to form the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform

UNITS OF MEASUREMENT

ha	Hectares
km	kilometres
Km/h	Kilometre per hour
kV	Kilovolt
m	metres
Mm	millimetre
MW	Megawatts

DEFINITIONS AND TERMINOLOGY

Alien species – (a) a species (plant or animal) that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Auditing – A systematic, documented, periodic and objective evaluation of how well the environmental management programme is performing with the aim of helping to safeguard the environment by facilitating management control of which would include meeting regulatory requirements.

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

Contaminated water – Water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.

Corrective action – Reactive response required to address an environmental problem that is in conflict with the requirements of the EMP. The need for corrective action may be determined through monitoring, audits or management review.

Dust – Any material composed of particles small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight into the sampling container from the ambient air.

Environmental Impact Assessment - is a process that evaluates the environmental and socio-economic characteristics of proposed projects and the consequences of the project on the environment and the people that live in the area affected by the project activities. Where negative impacts are likely to result from the project, measures can be recommended to avoid or lessen these impacts to a level where the impacts are considered environmentally and socially acceptable. Where positive impacts are likely to result from the project, measures can be recommended to increase these impacts. The EIA process also provides interested and affected parties (I&APs) with an opportunity to comment on the project and to be kept informed about decisions that may affect them or the environment.

Environmental Management Programme – an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced.

Erosion – The loss of soil through the action of water, wind, ice or other agents, including the subsidence of soil.

Method Statement – A written submission setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Project manager/Client/ECO when requesting the Method Statement, in such detail that the Project Manager/Client/ECO is enabled to assess whether the Contractor's proposal is in accordance with the Specifications/EMPr and/or will produce results in accordance with the Specifications/EMPr.

The method statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from site;
- how the equipment/ material will be moved while on site;
- of any liquid or material that may occur;
- how and where material will be stored, the containment (or action to be taken if containment is not possible) of leaks or spills timing and location of activities;
- compliance/ non compliance with the Specifications; and
- any other information deemed necessary by the Engineer.

Mitigation – Measures designed to avoid, reduce or remedy adverse impacts.

Monitoring – The repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures.

Pollution – Any change in the environment caused by (a) substances, (b) radioactive or other waves; or (c) noise, odours, dust or heat; emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

Reasonable – Unless the context indicates otherwise, reasonable in the opinion of the relevant environmental authority.

Ripping – The action of loosening of the soil to a depth of 300mm, parallel to the contours and not more than 300mm apart.

Scarifying – Loosening the soil in areas which have become hard and compacted and which need to be loosened in order to facilitate revegetation.

Solid waste – All non-liquid waste including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Subsoil – The soil horizons between the topsoil horizon and the underlying parent rock.

Topsoil – The upper soil profile irrespective of the fertility appearance, structure, agriculture potential, fertility and composition of the soil, usually containing organic material and which is colour specific.

Waste – Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the National Environmental Management: Waste Act (No. 59 of 2008).

Watercourse – (a) a river or spring, (b) a natural channel in which water flows regularly or intermittently, (c) a wetland, pan, lake or dam into which, or from which, water flows.

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1 INTRODUCTION

1.1 Overview

This document represents the life-cycle Environmental Management Programme (EMPr) for a proposed Wind Energy Facility (WEF) (hereinafter referred to as Kokerboom 3 WEF), with a maximum generation capacity of up to 300MW and associated infrastructure on adjacent farms (Portions 1 & 2 of Karree Doorn Pan No. 214 and the Remainder of Aan De Karree Doorn Pan No. 213) near Loeriesfontein in the Northern Cape. The associated infrastructure proposed comprises an onsite substation, the medium voltage cables linking each turbine to the substation, permanent operations & maintenance (O&M) facilities, battery energy storage system (BESS), access and internal service roads, fencing and gates, and temporary construction camp and laydown areas that will be used during the construction period, as well as other additional ancillary infrastructure. More detail is provided on the project description in Section 2.1

1.2 Purpose of the EMPr

The EMPr has been included as an appendix to the environmental impact assessment report (EIR) in order to provide a link between the impacts identified in the Environmental Impact Assessment Process (undertaken in terms of the Environmental Impact Assessment (EIA) Regulations GN R982, as amended) and the actual environmental management on the ground during project implementation and operation. Although it is unclear whether decommissioning will happen, appropriate measures provided by the environmental assessment practitioner (EAP) and specialists have been provided. The purpose of this document is to provide for environmental management throughout the various life-cycle stages of the proposed development. The following stages are included:

- Planning and design;
- Pre-construction and construction;
- Operation; and
- Decommissioning.

The EMPr is a working document which the proponent (the holder of the Environmental Authorisation for the project, if granted) and any of their consultants and contractors may refer to during implementation phases of the project and against which their environmental performance may be appraised.

Note that this EMPr should not be seen as a static document and should remain flexible to changes in project planning, although the Department of Forestry, Fisheries and Environment (DFFE) should be notified of significant changes or deviations in accordance with the applicable EMPr amendment provisions in the EIA Regulations. Such notification should be submitted with a motivation for such deviation and DFFE given opportunity to comment and review conditions of the Authorisation. Significant deviations may necessitate an amendment of the Environmental Authorisation which is subject to a predefined set of procedures and involves a public participation process.

1.3 Legal requirements of the EMPr

Appendix 4 of the NEMA EIA Regulations 2014 (as amended) specifies the requirements of an Environmental Management Programme. The table below serves as a guide of how the requirements detailed in Appendix 4 has been adhered to:

Table 1: Requirements of an Environmental Management Programme (EMPr) as detailed in Appendix 4 of the NEMA EIA Regulations 2014 (as amended).

	Requirement	Reference
1(a)	(i) details of the EAP who prepared the EMPr; and	Section 1.5
	(ii) details of the expertise of that EAP to prepare an EMPr, including a curriculum vitae	Section 1.5
1(b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 2
1(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;	Section 2
1(d)	a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including -	Section 5 & 6
	(i) (i) planning and design;	Section 5
	(ii) (ii) pre-construction activities;	Section 5
	(iii) (iii) construction activities;	Section 5
	(iv) (iv) rehabilitation of the environment after construction and where applicable post closure;	Section 5 & 6
(v) (v) where relevant, operation activities;	Section 5	
1(e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d)	Section 5 & 6
1(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	Section 5 & 6
	(i) (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Section 5 & 6
	(ii) (ii) comply with any prescribed environmental management standards or practices;	Section 5 & 6
	(iii) (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	Section 4.8
(iv) (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A	
1(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5 & 6
1(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	Section 5 & 6 – Monitoring Column
1(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 5 & 6
1(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 5 & 6
1(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 5 & 6
1(l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 4.3
1(m)	an environmental awareness plan describing the manner in which -	Section 6.3
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	Section 6.3
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 6.3
1(n)	any specific information that may be required by the competent authority.	None to date.

The Department of Environmental Affairs & Development Planning's (DEA&DP²) *Guideline for Environmental Management Plans* (2005) aims to inform and guide the preparation and implementation of EMPs. The requirements outlined within the guideline as well as the requirements specified in Appendix 4 of the EIA Regulations 2014 (as amended) (Table 1 above) have been considered in compiling this document. The DEA&DP guideline defines EMPs as:

“an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced”

The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. The Department requires that the EMP be submitted together with the Assessment Report so that it can be considered simultaneously.

This document should be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available, unforeseen situations arise or conditions warrant adaptation.

Section 24N (2) and (3) of the NEMA listing the requirements of an EMP are given in Table 2.

Table 2: Section 24N (2) and (3) of the NEMA listing the requirements of an EMP.

<p>24N.(2) the environmental management programme must contain-</p> <p>(a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –</p> <p style="padding-left: 40px;">(i) planning and design;</p> <p style="padding-left: 40px;">(ii) pre-construction and construction activities;</p> <p style="padding-left: 40px;">(iii) the operation or undertaking of the activity in question;</p> <p style="padding-left: 40px;">(iv) the rehabilitation of the environment; and</p> <p style="padding-left: 40px;">(v) closure, where relevant.</p> <p>(b) details of –</p> <p style="padding-left: 40px;">(i) the person who prepared the environmental management programme; and</p> <p style="padding-left: 40px;">(ii) the expertise of that person to prepare an environmental management programme</p> <p>(c) a detailed description of the aspects of the activity that are covered by the draft environmental management plan;</p> <p>(d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);</p> <p>(e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.</p> <p>(f) as far as is reasonable practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and</p> <p>(g) a description of the manner in which it intends to-</p> <p style="padding-left: 40px;">(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</p> <p style="padding-left: 40px;">(ii) remedy the cause of pollution or degradation and mitigation of pollutants; and</p> <p style="padding-left: 40px;">(iii) comply with any prescribed environmental management standards or practices.</p> <p>(3) the environmental management programme must, where appropriate-</p> <p>(a) set out time periods within which the measures contemplated in the environmental management programme must be implemented;</p> <p>(b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining</p>

² Please note that DEA&DP's guideline is used as DFFE has not compiled a guideline on EMPs.

	<i>activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and</i>
(c)	<i>develop an environmental awareness plan describing the manner in which-</i>
	<i>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</i>
	<i>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.</i>

1.3.1 Listed Activities in terms of NEMA

The NEMA (as amended), provides the framework for environmental decision-making in the country and specifically the EIA Regulations (2014, as amended) serve as the instrument through which development decisions are made. South Africa has rigorous and comprehensive environmental legislation aimed at preventing degradation of the environment. Section 28(1) of NEMA places a “*duty of care and remediation of environmental damage*” on every person who causes, has caused, or may cause, significant environmental degradation. This is a far-reaching obligation, and accordingly, those parties responsible for the degradation of the environment have a legal duty to avoid, minimise or mitigate such impacts.

This has resulted in a set of Listed Activities that can be triggered by developments of a certain nature and/or taking place in sensitive environments, e.g. watercourses. Table 3 below contains the listed applicable to this project:

Table 3: Listed Activities triggered by the Kokerboom 3 WEF

Listing Notice	Activity Number
Listing Notice 1: GN R983 of 8 December 2014 as amended on 7 April 2017 (GN R327)	11, 12, 14, 19, 24, 28, 56
Listing Notice 2: GN R984 of 8 December 2014 as amended on 7 April 2017 (GN R325)	1, 15
Listing Notice 3: GN R985 of 8 December 2014 as amended on 7 April 2017 (GN R324)	18

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
GN R983 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”.	An on-site collector substation, including a BESS, would be required for the Kokerboom 3 Wind Farm which would step up power from 33 kV to 132 kV. Turbines would be linked to each other and the on-site substation via overhead and/or subterranean medium voltage cables (~33 kV).
GN R983 Activity 12	The development of – (ii) infrastructure or structures with a physical footprint of 100m ² or more; Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32m of a water course, measured from the edge of a watercourse;	Drainage lines scattered across the proposed site. The proposed roads, powerlines and/ or other infrastructure are to cross these drainage lines or be within 32m thereof.
GN R 983	The development and related operation of facilities or infrastructure, for the storage, or for	The approximate area of 2 ha has been designated for battery storage within the

Activity 14	the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500cubic metres.	substation and O&M Complex. The BESS would have a capacity of up to 150MWh and would utilise either lithium-ion or redox flow technology.
GN R983 Activity 19	The infilling or depositing of any material of more than 10m ³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m ³ from a watercourse;	The infilling or depositing of any material of more than 10m ³ into a watercourse will be triggered with the construction of internal service roads or cables across drainage lines.
GN R983 Activity 24	The development of a road - (ii) with a reserve wider than 13.5 metres, or where no reserve exists where the road is wider than 8 metres;	Existing farm tracks would be utilized and upgraded where possible, however new roads would also be developed. A total road length of approximately 95km will be required. A 20 m wide road reserve is required; this accounts for a 6 m road surface width, 1 m for side drains either side, and a further 6 m either side of the road surface for MV cable trenches and associated disturbance. After construction the road would be rehabilitated down to 8 m wide (6 m wide road surface + 1 m drain either side) (ie. 8 m road width is permanent with an additional 12 m temporary during construction making up the 20 m road reserve.) Roads would be provided with a gravel wearing course. The wind farm terrain is relatively flat therefore cut to fill activities are expected to be limited.
GN R983 Activity 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1ha.	The proposed farm portions on which the project is proposed are being used for livestock grazing (mostly sheep).
GN R983 Activity 56	The widening of a road by more than 6 m, or lengthening of a road by more than 1 km – (ii) where no reserve exists, where the existing road is wider than 8m.	Access roads of approximately 8 m in width, with a 12 m buffer/ road reserve would be required to develop the proposed WEF and in combination would exceed 1km. Existing roads would be used as far as practically possible and feasible, but would require widening by more than 6 m.
Activity No(s):	Provide the relevant Scoping and EIA Activity(ies) as set out in Listing Notice 2 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
GN R984 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 wind farm would have a maximum generation capacity of up to 300MW.

GN R984 Activity 15	“The clearance of an area of 20 hectares or more of indigenous vegetation... “	Physical alteration of undeveloped land for the WEF would take place and would require clearing of indigenous vegetation. The total area to be disturbed is expected to be approximately 175.6ha temporary and 168.2ha permanent.
Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
GN R985 Activity 18	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km. (g) Northern Cape (ii) Outside urban areas: (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	Access roads of approximately 8 m in width, with an approximate 12 m wide buffer/ road reserve would be required to develop the proposed wind farm and in combination would exceed 1km. Existing roads would be used as far as practically possible and feasible, but would require widening by more than 4 m. Some of these roads may traverse drainage lines or fall within 100 m from the edge of a watercourse or wetland.

1.4 Structure of the EMPr

The EMPr has been structured to include the following sections to address environmental management throughout the project life-cycle:

- Chapter 1: Overview of the project and legislative context.
- Chapter 2: Project description providing a summary of the proposed development.
- Chapter 3: Summary of the impacts that were assessed by the various specialists as part of the EIA.
- Chapter 4: Implementation of the EMPr, detailing the roles and responsibilities of the various role players involved in the implementation of this EMPr, compliance inspection, monitoring, record keeping and method statements.
- Chapter 5: Pre-Construction, Construction, Operational and Decommissioning phase requirements
- Chapter 6: Plans, Permits and Programmes

1.5 Expertise of the Environmental Assessment Practitioner

Zutari (Pty) Ltd has been appointed to undertake the EIA process and the development of the EMPr. The *curriculum vitae* of the Environmental Assessment Practitioners (EAPs) who compiled this EMPr are included in Annexure A. The authors of this report are listed in the table below.

Table 4: Expertise of the EAPs

EAP	Charles Norman	Corlie Steyn
Qualifications	MPhil in Environmental Law	MPhil in Environmental Management
Years of experience	31	15
Environmental management experience	<ul style="list-style-type: none"> – Environmental Impact assessment (EIA) – Basic Assessment Reports – Environmental and socio-economic impact assessment (ESIA) – Environmental pre-feasibility and scoping studies – Section 24G Rectification Processes 	<ul style="list-style-type: none"> – Environmental Impact assessment (EIA) – Basic Assessment Reports – Environmental and socio-economic impact assessment (ESIA) – Environmental pre-feasibility and scoping studies – Section 24G Rectification Processes

	<ul style="list-style-type: none"> – Environmental Management Programmes (EMPr) – Environmental Control Officer (ECO) – Public Participation Processes – Maintenance Management Plans – Environmental and Social Due Diligence 	<ul style="list-style-type: none"> – Environmental Management Programmes (EMPr) – Public Participation Processes – Maintenance Management Plans
Industries of experience	<ul style="list-style-type: none"> – Energy – wind, PV, hydro & coal – Desalination – Mining – Services Infrastructure Delivery – Municipal Housing – Dangerous Goods Storage – Water Storage – Industrial Decommissioning – Transport – rail & road – Environmental Rehabilitation – Environmental Auditing and Monitoring 	<ul style="list-style-type: none"> – Hydro & Coal – Mining – Services Infrastructure Delivery – Water Storage – Municipal Housing – Waste – Environmental Auditing and Monitoring – Borrow Pits – Transport - Road – Environmental Rehabilitation - Wetlands
Countries of experience	<ul style="list-style-type: none"> – South Africa – Mozambique – Namibia – Tanzania – Uganda – Kenya – Zambia – Mauritius 	<ul style="list-style-type: none"> – South Africa – Zambia – DRC – Malawi – UAE – Australia
Memberships	Member of the South African affiliate of the International Association of Impact Assessment (IAIA).	<ul style="list-style-type: none"> – Professional EAP registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA) – Member of the South African affiliate of the International Association of Impact Assessment (IAIA).

1.6 Project Phasing

1.6.1 Pre-construction Phase/Activities

The pre-construction phase includes activities such as:

- Pre-Construction monitoring;
- Appointment of the contractor/consultants;
- Contractor develop code of conduct for employees;
- Appointment of an Environmental Control Officer (ECO) and ther relevant contractors and consultants;
- Pre-construction environmental workshop/induction training of all employees;
- Site demarcation;
- Establishment of a site camp;
- Demarcation of areas such as fuel areas and plant rescue (when applicable);
- Processes to obtain permits for e.g. permits required to remove any protected tree or plant species;
- Selection of turbine model;
- Finalising of detailed design;
- Finalisation of any additional management and monitoring plans.

1.6.2 Construction Phase

The construction phase commences with earthworks and thereafter includes all activities relating to the construction of the proposed development e.g. construction of internal roads, installation of services, construction of foundations, erecting wind turbines, construction of auxiliary buildings etc.

1.6.3 Operational Phase

The operational phase commences when the proposed development is being used for its intended purposes i.e. providing power into the national grid. This phase will include ongoing operation and maintenance of the wind farm, as well as ongoing environmental management and monitoring requirements (e.g. removal of alien vegetation and undertaking of the faunal monitoring programme).

1.6.4 Decommissioning Phase

The decommissioning phase refers to the discontinuation of the wind farm should the option to upgrade the facility not be favourable at the end of its life-cycle (20 - 25 years). This would entail disconnecting the facility from the national grid, removing any components to be recycled / resold as far as possible and dismantling of the facility with all its associated structures and infrastructure. Final rehabilitation of the site would also form part of the decommissioning phase.

2 Project Description

2.1 Site location and description

The proposed site of the Kokerboom 3 Wind Farm is located approximately 60 kilometres (km) north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape.

Access to the site is off the public Granaatsboskolk Road, which traverses the north-east section of the site. Three access points are proposed (one or all may be developed, given the extent of the site). For the Kokerboom 3 Wind Farm, up to 60 turbine locations are proposed to achieve the targeted generation capacity of a maximum of up to 300 MW. A facility substation, Operations & Maintenance building and a battery energy storage system (BESS) are proposed to be included as part of the Kokerboom 3 Wind Farm. The Kokerboom 3 Wind Farm footprint is approximately 175.6 ha (temporary) and 168.2ha (permanent) and will be located on the farms listed The project location is shown in Figure 1

Table 5: Kokerboom 3 farm details

Erf number	21-digit SG code	Name of farm	Farm Size (ha)
1/214	C0150000000021400001	Karree Doorn Pan (Portion 1)	5,094.23
2/214	C0150000000021400002	Karree Doorn Pan (Portions 2)	5,094.24
RE/213	C0150000000021300000	Aan De Karree Doorn Pan	2,580.00

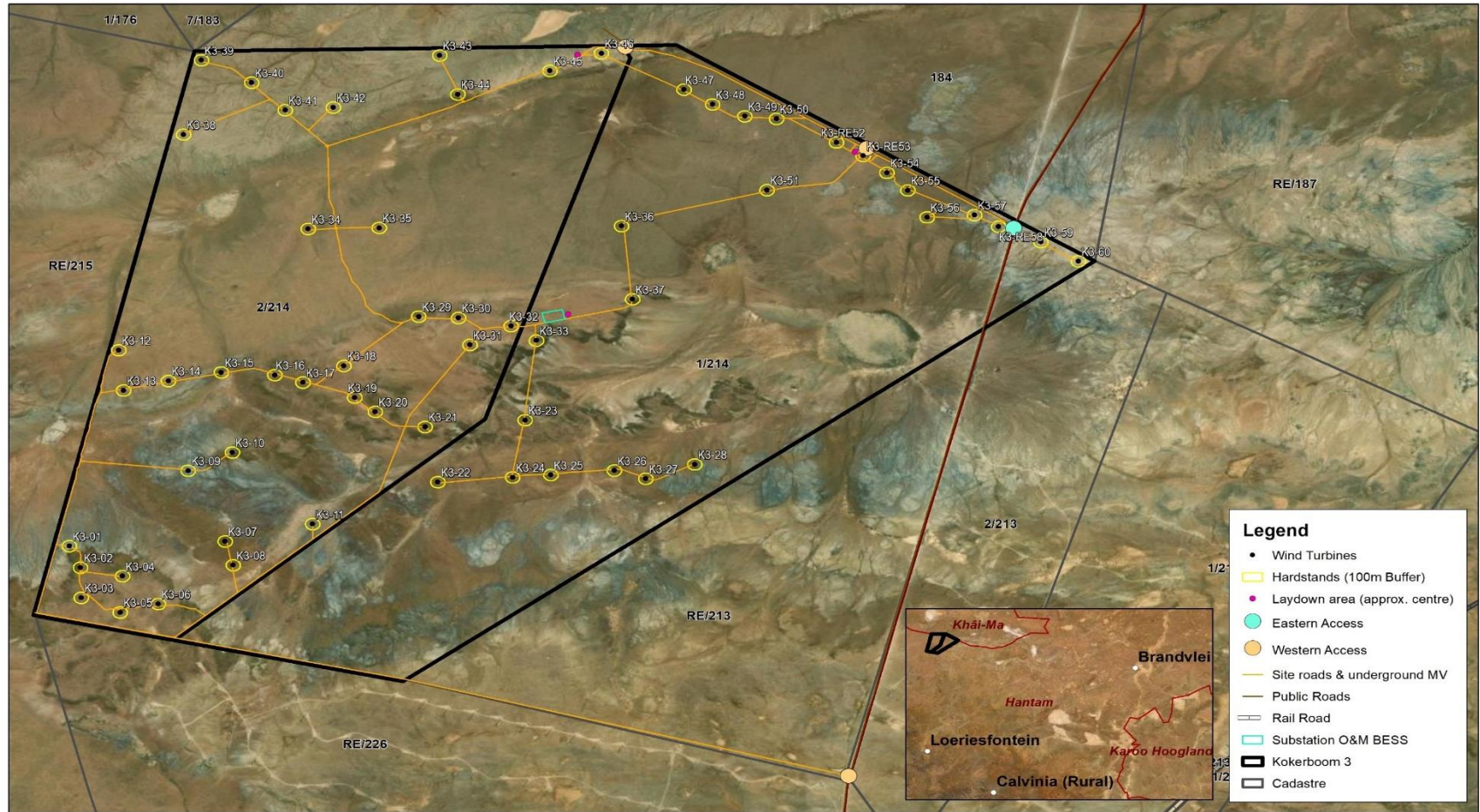
2.2 Project components

An operational wind farm is comprised of several components which support large scale energy generation. These components are described in this section and a summary of the projects components and specifications are included in Table 6 and a site layout provided in Figure 2

Table 6: Summary of the Kokerboom 3 WEF components and specifications

Project Components Description	Specifications & Footprint areas	Estimated Combined Footprint (ha)
Location and Total site size	The proposed site is located approximately 60 km north of Loeriesfontein, 85 km west of Brandvlei and 160 km south east of Springbok in the Namakwa District Municipality and the Hantam Local Municipality. Land use of the site and surrounding properties comprise of low-density livestock farming (grazing).	-
Wind Turbines	<ul style="list-style-type: none"> Up to a maximum of 60 wind turbines. Turbine envelope: <ul style="list-style-type: none"> Rotor diameter: up to 180 m (90 m blade) Hub height: up to 150 m Rotor top tip height: up to 240 m Steel or concrete towers Kokerboom 3 has a targeted nameplate capacity of up to a maximum of 300 MW. 	-
Turbine Foundations and Hardstands	<p>At each turbine position there will be</p> <ul style="list-style-type: none"> A hardstand area of up to 150 m x 100 m A laydown/assembly area of ~150 m x 15 m <p>The turbine hardstands and laydown areas will be located within a 100 m radius of the turbine base. Turbine foundations will be reinforced concrete spread footings and/ or piled foundations with an approx. 26m diameter and will have a construction footprint of 32m X 32m (including the foundation).</p>	<p>3,2ha foundations (permanent)</p> <p>3ha foundations construction footprint (temporary, in addition to permanent footprint)</p> <p>90ha hardstand (permanent)</p> <p>13,5ha laydown (temporary)</p>
Cabling	Turbines to be connected to an on-site substation via 33 kV cables. Cables would be laid underground in trenches parallel to the roads within the road reserve. No overhead MV lines would run from the turbines to the on-site substation.	Cabling included within road reserve
Site roads	<p>Existing farm tracks would be utilized and upgraded where possible, however new roads would also be developed. A total road length of approximately 95km will be required.</p> <p>A 20 m wide road reserve is required; this accounts for a 6 m road surface width, 1 m for side drains either side, and a further 6 m either side of the road surface for MV cable trenches and associated disturbance.</p> <p>After construction the road would be rehabilitated down to 8 m wide (6 m wide road surface + 1 m drain either side) (ie. 8m road width is permanent with an additional 12 m temporary during construction making up the 20 m road reserve.)</p> <p>Roads would be provided with a gravel wearing course. The wind farm terrain is relatively flat therefore cut to fill activities are expected to be limited.</p>	<p>±76ha (8m width) (permanent)</p> <p>114ha (12m width) (temporary)</p>
Facility Substation and O&M Complex	<p>A 5 ha area has been identified for the substation and Operational and Management (O&M) complex. The following infrastructure would be located within 5 ha area:</p> <ul style="list-style-type: none"> Facility substation (approx. 1ha) O&M building (approx. 0.5 ha) Oil storage area (less than 30m³) (approx. 0.1 ha) Battery Energy Storage Facility (approx. 2 ha) Associated facilities including the parking area 	5ha (permanent)
Battery Energy Storage System (BESS)	The approximate area of 2 ha has been designated for battery storage within the substation and O&M Complex. The BESS would have a capacity of up to 150 MWh and would utilise either lithium-ion or redox flow technology.	Within O&M complex
Construction Laydown Areas	Three construction laydown areas of up to 15 ha each are proposed - two near the entrances of the site and the other near the substation. One or all of the laydown areas may be utilized.	up to 45ha (temporary)

	The laydown areas would include temporary site offices, stores, workshops, turbine storage areas, fuel storage, worker mess and ablution facilities etc. These areas would be rehabilitated after construction.	
Concrete Batch Plant	A centralised concrete batch plant would be erected for the concrete works required during construction. An area of approximately 100 m x 100 m is required for the batch plant. The batch plant area would include aggregate stockpile areas, cement silos, truck parking areas and the batch plant itself. The batch plant will be located within one of the indicated laydown areas.	Included within Construction Laydown Area
Total disturbance footprint	175.6 ha temporary and 168.2ha permanent	





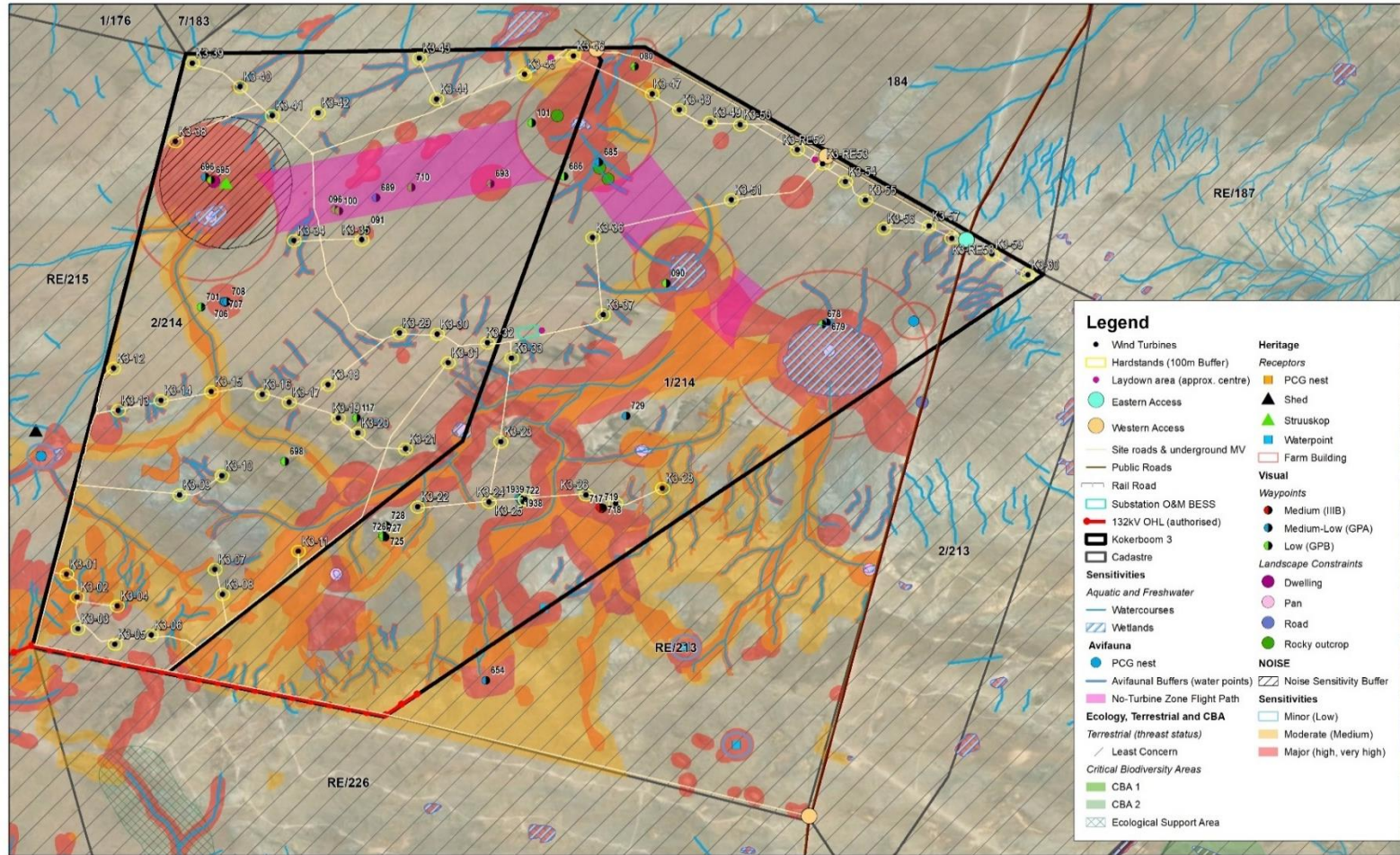
	CLIENT BVI 2105	DRAWING TITLE LOCALITY and FINAL LAYOUT (inclusive of infrastructure)	PROJECT TITLE PROPOSED KOKERBOOM 3 WIND FARM	0 285 570 1140 1710 2280 1:80 000 Aurecon GIS FILE NAME (Document Name: Kokerboom3 Locality 2021_v1) DRAWING NUMBER 
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Figure 1:Kokerboom 3 WEF Location



	CLIENT	BVI 2105	DRAWING TITLE	ENVIRONMENTAL SENSITIVITIES	PROJECT TITLE	PROPOSED KOKERBOOM 3 WIND FARM	
							Aurecon GIS FILE NAME 1301900 Location of Name: Kokerboom3_Environmental_Sensitivities DRAWING NUMBER

Figure 2: Kokerboom 3 WEF layout and associated infrastructure superimposed over mapped environmental sensitivities

3 Environmental Aspects

3.1 Impacts Assessed as part of the EIA.

During the EIA the various specialists identified a number of impacts to be assessed and proposed mitigatory measures to manage the various potential impacts. The outcome, and intent, of the impact management recommendations i.e. mitigation measures, is to reduce the level of an impact on the environment to acceptable levels. The preferred method would be to avoid impacts; however, this is not always possible.

The various identified impacts were assessed as part of the EIA and were assigned with an anticipated impact rating (significance) for both pre- and post-mitigation. The significance ratings are summarised according to environmental impact and project phase in Table 7 below.

The proposed wind farm and its various components are superimposed on the identified environmental no-go areas of the site (as identified by the specialists) as shown in Figure 2

Table 7: Summary of potential impacts identified. The impact of each impact pre- and post-mitigation is also provided.

Aspect	Impact	Pre-mitigation	Post-mitigation
Pre-construction			
No impacts have been identified for the pre-construction phase.			
Construction			
Terrestrial Ecology	Direct of loss of vegetation and or important habitats	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Direct of loss of faunal species	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Direct loss of any species of special concern (Fauna & Flora)	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Increased risk of alien plant invasion	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Bats	Roost disturbance	Moderate (-)/ Medium (-)	Minor (-)/Low (-)
	Roost destruction	Moderate (-)/ Medium (-)	Minor (-)/Low (-)
	Loss of foraging habitat	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Creating bat conducive habitat on the development terrain	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Avifauna	Displacement of priority species due to disturbance (Minor (-)/Low (-)	Minor (-)/Low (-)
	Displacement of priorities species due to habitat transformation	Minor (-)/Low (-)	Minor (-)/Low (-)
	Mortality of priority avifauna due to turbine collisions	Moderate (-)/ Medium (-)	Minor (-)/Low (-)
Aquatic Ecology	Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies	Minor (-)/Low (-)	Negligible (-)/ Very low (-)

Aspect	Impact	Pre-mitigation	Post-mitigation
	Potential impact on localised surface water quality (construction materials and fuel storage facilities)	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Impact on alluvial riverine systems and wetland systems through the possible increase in surface water runoff on form and function during the operational phase	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Heritage	Impact to archaeological resources	Moderate (-)/ Medium (-)	Negligible (-)/ Very low (-)
	Impacts to the cultural landscape	Minor (-)/Low (-)	Minor (-)/Low (-)
Socio-economic	Creation of employment and business opportunities	Moderate (+) Medium (+)	Major (+)/ High (+)
	Impacts associated with the presence of construction workers on site and in the area	Moderate (-)/ Medium	Minor (-)/Low
	Influx of job seekers	Minor (-)/ Low	Minor (-)/Low
	Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure	Moderate (-)/ Medium	Minor (-)/Low
	Increased risk of grass fires	Moderate (-)/ Medium	Minor (-)/Low
	Impact of construction related activities, including damage to roads, noise, safety and dust	Moderate (-)/ Medium	Minor (-)/Low
	Loss of grazing resources	Moderate (-)/ Medium	Minor (-)/Low
Noise impacts	Increase in construction noise during the day	Negligible (-)/ Very low (-)	Negligible (-)/ Very low (-)
	Construction activities at night	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Construction of roads	Negligible (-)/ Very low (-)	Negligible (-)/ Very low (-)
	Daytime construction traffic	Negligible (-)/ Very low (-)	Negligible (-)/ Very low (-)
Visual	Presence of large construction vehicles (including cranes)	Minor (-)/Low (-)	Minor (-)/Low (-)
Transport	Roads, maintenance and safety	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Operation			
Terrestrial Ecology	Increased risk of alien plant invasion	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Increased risk of alien plant invasion	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Bats	Bat mortalities caused by attraction to turbines from artificial lighting	Major (-)/ High	Moderate (-)/ Medium
	Bat mortalities due to direct blade impact or barotrauma during migration	Major (-)/High	Minor (-)/Low
	Artificial lighting	Moderate (-)/ Medium	Minor (-)/Low

Aspect	Impact	Pre-mitigation	Post-mitigation
Avifauna	Bat mortalities due to direct blade impact or barotrauma during foraging and commuting activities	Moderate (-)/ Medium (-)	Minor (-)/Low (-)
Heritage	Impacts to the cultural landscape	Minor (-)/Low (-)	Minor (-)/Low (-)
Socio-economic	Establishment of renewable energy infrastructure	Moderate (-)/ Medium (-)	Moderate (+)/ Medium (+)
	Creation of employment and business opportunities	Minor (+)/Low (+)	Moderate (+)/ Medium (+)
	Benefits associated with the establishment of a Community Trust	Moderate (+)/ Medium (+)	Major (+)/ High (+)
	Potential impact on property values	Minor (-)/Low	Minor (-)/Low
	Potential impact on tourism	Minor (-)	Minor (+)/ Minor (-)
Noise	Operational activities at night	Negligible (-)/ Very low (-)	Negligible (-)/ Very low (-)
Visual	Visual intrusion from large and moving wind turbines in the landscape	Moderate (-)/ Medium (-)	Moderate (-)/ Medium (-)
	Landscape change from construction of BESS, O&M and Substation in operation phase	Minor (-)/ Low (-)	Minor (-)/Low (-)
EMI/ RFI	Electromagnetic and radio frequency interference on SKA infrastructure	Minor (-)/Low (-)	Minor (-)/Low (-)
Transport	Roads, maintenance and safety	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Decommissioning			
Terrestrial Ecology	Direct of loss of faunal species	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Direct of loss of faunal species	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Increased risk of alien plant invasion	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Increased risk of alien plant invasion	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Avifauna	Displacement of priority species due to disturbance	Minor (-)/Low (-)	Minor (-)/Low (-)
Aquatic Ecology	Potential impact on localised surface water quality (construction materials and fuel storage facilities)	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Impact on alluvial riverine systems and wetland systems through the possible increase in surface water runoff on form and function during the operational phase	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
Heritage	Impacts to the cultural landscape	Minor (-)/Low (-)	Minor (-)/Low (-)
Socio-economic	Increased risk of grass fires	Minor (-)/Low (-)	Negligible (-)/ Very low (-)
	Impact of construction related activities, including damage to roads, noise, safety and dust	Minor (-) Low (-)	Negligible (-)/ Very low (-)
	Generation of income for affected landowners	Minor (+)/Low (+)	Moderate (+)/ Medium (+)

Aspect	Impact	Pre-mitigation	Post-mitigation
	Benefits associated with the establishment of a Community Trust	Minor (+)/Low (+)	Major (+)/High (+)
	Loss of jobs and associated income due to decommissioning	Moderate (-)/Medium (-)	Negligible (-)/Very low (-)
Visual	Presence of large construction vehicles (including cranes)	Minor (-)/ Low (-)	Minor (-)/ Low (-)
	Aircraft warning lights at nighttime	Moderate (-)/Medium (-)	Minor (-)/ Low (-)
Transport	Roads, maintenance and safety	Minor (-)/ Low (-)	Negligible (-)/Very low (-)

A number of mitigatory measures were provided by the various specialists during the EIA phase to guide the development of the project considering the environmental sensitivities present at the site and each identified impact. Mitigatory measures relating to planning were implemented during the EIA phase and those related to management of the construction-, operation- and decommissioning-phases are included in the EMPr.

4 Implementation of the EMPr

4.1 Roles and responsibilities during the construction phase

4.1.1 Project Company/ Proponent

The Project Company (Also referred to as the proponent) refers to the holder of the Environmental Authorisation (EA) who will assume overall responsibility for the administration and implementation of the EA and EMPr. The Project Company will be responsible for the following tasks amongst others:

- Ensure that all conditions of approval as contained in the EA are adhered to;
- Ensure that the requirements as set out in this EMPr are adhered to and implemented;
- Ensure all authorisations, permits, consents are in place and any other legal requirements are settled before any action is undertaken that requires these to be in place;
- Provide resources and appoint external contractors as required for the implementation of this plan;
- Review and update the EMPr to include relevant conditions of approval contained in the EA (if applicable) or where necessary.
- Provide all principal contractors working on the project with a copy of this EMPr as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts;
- Ensure close liaison with local municipal managers, local councillors and other stakeholders involved in socio-economic development to ensure that the project is integrated into wider socioeconomic development strategies and plans for the area.

4.1.2 Site Engineer (SE) and/or Contract Manager

The term “Engineer” in the context of the EMPr refers to the company or companies so named in the Contract Data, whose function it is to administer the Contract as an agent to the Project Company. The term “Engineer” may also refer to “Employer’s Agent” or “Project Manager” depending on the construction contract.

The natural person nominated by the Engineer, who shall observe the execution of the Works, examine and test materials and workmanship, and deliver and receive communications to/from the Contractor is the Contract Manager.

The term “Contract Manager” may also refer to “Employer’s Agent Representative” or “Supervisor” depending on the construction contract.

The role of the Site Engineer and/or Contract Manager, pertaining to environmental matters, may include:

- Acting as an agent to the Project Company on matters relating to the environment, and compliance with the EMPr.
- Ensure compliance and monitoring of all Health, Safety and Environmental aspects as it relates to the project and in accordance with the relevant legislation e.g. Occupational Health and Safety Act (OHSA).
- Receive and review ECO Reports, ensure that any issues are addressed and report to management as required.
- Approving, in consultation with the ECO, the Contractor’s Method Statements required in terms of the EMPr.
- Ensuring that the Contractor is well-versed in the contents of the EMPr and that their conduct is proactive and effective in term of environmental management and protection measures.
- Ensuring the Contractor is aware of its responsibilities in terms of the EMPr including, including (but not limited to):
 - Appointing an environmental officer/s to assist with the EMPr implementation.
 - Maintaining a register of public complaints and a record of how these are responded to and the timeframe provided for this.
 - Supporting the ECO in their role and responsibilities.
- Issue instruction to cease work where such an instruction is warranted and issuing of any relevant fines or disciplinary action that may be applicable

4.1.3 Contractor

The Contractor must ensure that all of its sub-contractors, employees, etc., are fully aware of the environmental issues detailed in this EMPr. The Contractor shall liaise closely with the SE/Contract Manager, and the ECO and must ensure that the works on site are conducted in an environmentally sensitive (prevent actions that may cause environmental harm) and safe manner and in accordance with the requirements of the EMPr, at all times.

The contractor must ensure compliance of all site personnel/visitors to the EMPr and other conditions of approval where relevant

4.1.4 Environmental Control Officer

The Project Company shall appoint a suitably qualified independent ECO to monitor the Contractor’s compliance in terms of this EMPr and the conditions contained in the EA, as well as address environmental site issues. The ECO shall work in close relation with the Contractor’s appointed EO. The designation is reserved for a suitably qualified (National Diploma / Degree in Natural Science or an equivalent qualification), independent, environmental manager, with adequate environmental knowledge to understand and monitor the implementation of the EMPr.

The duties of the ECO include but are not limited to:

- Liaison with the Project Company, Site Engineer and/or Contract Manager and DFFE;
- Conduct environmental induction training with the contractor prior to commencement of work;
- Undertake routine monitoring of the Contractor’s activities for compliance with the various environmental requirements contained in the EMPr and any specific conditions of authorisation contained in the EA. , including:

- Undertaking compliance inspections and audits at defined intervals as per the ECO Schedule in Section and the requirements of the conditions of the EA, including:
 - Undertaking compliance inspections and audits at defined intervals as per the ECO Schedule in Section and the requirements of the conditions of the EA.
 - Compilation of ECO Reports on the findings of the inspections and audits, as well as on any emergency or unforeseen situations in which the expertise of the ECO has been consulted.
 - The ECO Reports must be submitted to the project team, DFFE, Project Company and Eskom (or any other authority/body deemed necessary by the project team).
- The ECO must attend relevant site meetings with the engineer, contractor and other relevant project team members at least once a month or as may be required depending on circumstances or any issues that need to be discussed;
- Conduct and/or oversee environmental induction and awareness training with the Contractor and staff for more detail in this regard);
- Monitoring compliance with the various environmental conditions/requirements contained in the EA and EMPr (refer to Section for Compliance Monitoring);
- Reviewing of the Contractor's Method Statements (from an environmental perspective) required in terms of this EMPr, prior to the proposed activities taking place;
- Ensuring the proactive and effective implementation and management of environmental protection measures;
- Monitoring that the requisite remedial action is implemented in the event of non-compliance and capturing proof of such in the subsequent ECO Report;
- Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately and timeously reported and addressed;
- Recording and reporting of environmental incidents;
- The ECO must immediately consult with the SE/Contract Manager and Contractor should any non-compliance meriting a potential 'stop-work' instruction be observed; and
- Providing ad-hoc environmental advice, including opinion on environmental legal requirements, to the Project Company and the Contractor regarding issues that may arise during the Contract.
- The ECO must be knowledgeable in all licencing and permitting requirements (issued and required) applicable to the site and can assist the contractor with obtaining such permits should any be outstanding.

4.1.5 Environmental Site Officer (ESO)

The 'ESO' refers to the nominated staff member of the Contractor who will fulfil the role of the Contractor's environmental representative to monitor, review and verify compliance with the EMPr. The ESO shall liaise closely with the SE/Contract Manager and the ECO and shall ensure that the works on site are conducted in an environmentally responsible manner and in compliance with the requirements of the EMPr.

The role of the ESO will include, but are not limited to:

- Liaison between the Contractor and ECO on matters relating to the environmental considerations on site;
- Assisting with the compilation of environmental components of Method Statements on behalf of the Contractor;
- Being appointed to the site throughout the duration of the construction phase;
- Provide environmental induction and awareness training to the Contractor's on-site staff.
- Undertaking frequent/daily inspections of the various work areas to ensure all activities are being undertaken in accordance with the EMPr;
- Maintaining all site documentation and records pertaining to the EMPr and environmental matters and approvals;
- Providing a regular and routine account on environmental matters for the ECO, including any environmental incidents, events or accidents, and reporting on any entries in the Environmental

Incident Report File or Complaints Register. This account may take the form of a written report or checklist or similar, or meeting with the ECO;

- Maintain a photographic record of the construction activities;
- Overseeing that corrective action is implemented within the stipulated timeframes where non-compliances are registered; and
- Responding to and reporting on environmental accidents, incidents and events immediately, and overseeing all works requiring remediation are undertaken in accordance with the ECO or SE/Contract Manager's instructions.

4.1.6 Community Liaison Officer (CLO)

The “CLO” refers to an independent Community Liaison Officer who ideally is a member of one of the local communities in the vicinity of the wind farm.

The role of the CLO will include:

- Facilitation of community relations for the duration of the construction phase.
- Providing recommendations for, and facilitating the notification or information dissemination methods for issues such as any planned service disruptions or nuisance disturbances.
- Liaise with the complainants to address any issues.

4.1.7 Competent Authority- National Department Forestry, Fisheries and the Environment

The National Department of Forestry, Fisheries and the Environment (DFFE) is the competent authority responsible for issuing the EA and compliance with the conditions of authorisation contained in the EA and relevant environmental legislation. Its responsibilities include amongst others:

- Overall enforcement of the EA and its conditions of authorisation;
- Review the EMPr and any required updates or revisions;
- May undertake compliance inspection site visits;
- Review ECO and audit reports;
- Review incident reports; and
- Enforce the applicable legal mechanisms should any contraventions of the EMPr or EA occur.

4.2 Roles and responsibilities during the Operational Phase

4.2.1 Project company & Operator

The Project Company may appoint a contractor (“Operator”) to oversee the operation of the WEF. The Project Company or Operator will need to appoint a Health and Safety (HSE) team to develop and implement HSE Management Plans and Systems for the operational phase.

4.2.2 HSE Team

The HSE Team will be responsible for:

- Drafting of the detailed HSE or equivalent documents which will include all of the operational aspects of the EMPr;
- Implement and enforce actions required by the detailed management plans (e.g. emergency response plans and safety plans associated with the battery storage facility), including monitoring and reporting;

- Training of workers in how to perform tasks required by the detailed management plans;
- Provide the required items including safety equipment and emergency response equipment required by the management plans;
- Manage waste contractors and other external contractors and consultants used in the operational phase of the project; and
- Update the management plans with any required changes as the project progresses.

4.3 Compliance Monitoring & Reporting

4.3.1 ECO Schedule

Routine Compliance Inspections and Reports:

The Contractor shall allow the ECO (and any officials from DFFE, should the need arise) access to the site for the purposes of compliance monitoring. The ECO shall undertake routine monitoring of the Contractor's activities for compliance with the various environmental requirements contained in the EMPr; including but not limited to:

- Undertaking routine compliance inspections:
 - On a monthly basis for the duration of the construction phase, or at the defined intervals as provided in the conditions of the EA if these are more frequent.
 - Documenting the findings of each of the inspections. This may take the form of a diary entries, a checklist, a report or similar, but should include dated photographic evidence of any identified issues (where possible). Any findings of non-compliance must be clearly communicated to the Contractor, together with timeframes for the implementation of remedial action and close out.
- Preparing a monthly report:
 - Summarising the findings of the routine compliance inspections undertaken as well as progress on any remedial action that was required during the month in question. In the event of non-compliance, the report might include:
 - Relevant/supporting documentation or evidence of the non-compliance (e.g. minutes of any meetings held to discuss the non-compliance, email/written correspondence on the matter, dated photographic evidence);
 - Remedial action required to remedy non-compliance or prevent repeat occurrences, including responsible persons and deadlines for such action;
 - Dates of eventual compliance or close-out by the Contractor on previous non-compliance findings.
- Making reports available to the Contract Manager and the Contractor, and to DFFE on request.
- Attending or submitting the monthly report to a minimum of one monthly progress meeting with the project team, which shall include the Contract Manager, the Contractor and the ESO (or representatives).

Environmental Emergencies, Incidents or Events:

Should there be any environmental emergencies or incidents, then the ECO may also elect to inspect the site in the event of these. The ECO shall ensure that any entries in the Environmental Incident Report File and Complaints Register are tabled at the monthly progress meeting and appropriately addressed.

4.3.2 Disciplinary Action, Penalties and Fines

Where a transgression occurs due to negligence, or due to disregard for the requirements of the EMPr, or due to ignoring remedial instruction from the ECO, SE/Contract Manager or relevant Authority, then this is unacceptable, and could result in a disciplinary action (e.g. a time penalty or a monetary fine, withholding payment certificates if in accordance with the terms of Contract, or even legal action). The terms of Contract shall include mechanisms for disciplinary action (such as the issuing penalties and

finances), and the recovery of any monies due (including for any remedial costs where these were born by a third party).

The level of non-compliance is ultimately to the discretion of the SE/Contract Manager, ECO and the Authorities, but a guide to determining this level in the event of negligence or disregard, and the associated minimum monetary fine for consideration is provided in Table 8 below (the table does not include for penalties or other mechanisms of disciplinary action, which could be implemented in addition to the monetary fine). Record shall be kept of any penalties or monetary fines issued for environmental transgressions (refer 4.9).

Activities that are directly endangering the environment or are resulting in a significant and detrimental breach of any Environmental Authorisation or EMPr condition may be stopped by the SE/Contract Manager in consultation with the ECO until such breach is rectified. Regulatory authorities such as the DFFE and The Northern Cape Environmental Affairs and Nature Conservation also have the right to stop activities in consultation with the SE/Contract Manager and ECO.

In all instances where costs are incurred in rectifying a breach of the EMPr, enforcing the provisions of the EMPr, or in taking remedial or preventative action to safeguard the environmental integrity, the costs will be recovered jointly or severally from the Project Company and/or the Contractor in accordance with the provisions of the contract between them. Note must be taken in this respect of Section 28 of NEMA which places a duty of care for environmental protection on “every person who causes, has caused or may cause significant pollution or degradation of the environment”.

Table 8: Guide to fine determination

Level of Non-Compliance	Description	Minimum Fine
Minor non-compliance (>3 repeated offences)	A non-conformance with the EMPr that has the potential to result in minor environmental or social consequence	R 2,000.00
Moderate non-compliance (>2 repeated offences)	A non-conformance with the EMPr that results in minor environmental or social consequence, or has the potential to result in major environmental or social consequence	R 5,000.00
Major non-compliance (1st offence)	A non-conformance with the EMPr that results in major environmental or social consequence	R 10,000.00

Funds generated by the imposition of fines should be donated to a suitable NGO involved in conservation work at the end of the construction period.

4.4 Environmental Incident report file

The Contractor shall keep an Environmental Incident Report File (EIRF) on site to document any environmental incidents, emergencies or accidents occurring as a result of the construction activities, and any resulting action taken to remedy the harm, and/or prevent repeat occurrences.

- The EIRF must have numbered pages. Any missing pages must be accounted for by the Contractor.
- Entries made shall be tabled during monthly site meetings.
- The EIRF shall be made available to the SE/Contract Manager, the ECO, the Project Company, and/or any authority at any time if requested.

The EIRF is to make provision for the documentation of:

- The exact nature of the environmental incident.
- The management team or contractor responsible for the activity.
- The timing and duration of the event.
- Witnesses to the event.

- The exact response action applied, including a list of those notified of the problem.

The Contractor shall ensure that the environmental incidents and resulting action are recorded in the EIRF, and that these are brought to the attention of the ECO as soon as practically possible. The procedure for dealing with an environmental incident shall include that:

- The EIRF is to be filled in by the ESO in the event of an environmental incident or emergency.
- The ESO is to immediately inform the Contractor and ECO and of any environmental emergency for a decision on remedial action.
- The ECO is to document any incidents / emergencies in the monthly compliance report, together with the remedial action taken, as described in the EIRF.
- The ECO shall monitor that the necessary procedures and responses are followed by the Contractor to close out any entries in the EIRF within the specified timeframe.
- Once an incident or emergency has been adequately addressed to the satisfaction of the ECO, the ESO is to close out the entry in the EIRF.

4.5 Complaints register

The Contractor shall keep a Complaints Register on site to allow the general public to document any comments on or complaints regarding the activities of the site:

- The Complaints Register must have numbered pages. Any missing pages must be accounted for by the Contractor.
- Entries made shall be tabled during monthly site meetings.
- The Complaints Register shall be made available to the SE/Contract Manager, the ECO, the Project Company, and/or any authority at any time if requested.

The Complaints Register shall include a section for the documentation of the action taken to address the complaint. The procedure for dealing with public complaints shall include:

- All complaints shall be investigated, and a response shall be given to the complainant within 28 calendar days.
- The ESO shall document the action taken to investigate, and address (if required) the complaint, as well as the response given (including timeframes).
- The ECO shall monitor that the complaints have been responded to.
- The ECO shall ensure that any public issues have been brought to the attention of the relevant authorities by the Contractor if so required, and appropriately addressed.

4.6 Method statements

An environmental Method Statement is a written submission by the Contractor to the SE/Contract Manager, to the satisfaction of the ECO, in response to a condition of approval and/or a requirement of the EMPr, or a request by the ECO or SE/Contract Manager. The Method Statement describes the plant, materials, labour and method that the Contractor proposes to use to carry out an activity, in such detail that the SE/Contract Manager and ECO are able to assess whether the Contractor's proposal is in accordance with the Scope of Work and/or will produce results in accordance with the EMPr.

Method Statements are required in terms of this EMPr (either specified below, or for any activities that are proposed as variations to the standard construction practices detailed or referred to in the Contract Documents, or for any activities requiring special attention as specified in this EMPr and/or requested by the ECO or SE/Contract Manager as well as any requirements of permits or licenses such as a Water Use License).

The Contractor shall not commence any activity until the Method Statement in respect thereof has been approved and shall, except in the case of emergency activities, allow a period of one week for consideration of the Method Statement by the SE/Contract Manager and ECO. Changes may be

requested if the proposal does not comply with the specification or if, in the reasonable opinion of the SE/Contract Manager and/or ECO, the proposal may result in, or carries a greater than reasonable risk of, damage to the environment in excess of that permitted by the EMPr:

- Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.
- Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the works in accordance with the approved Method Statement.

Any proposed changes to the original approved environmental Method Statements require the submission of amended Method Statements for approval

4.6.1 Required Method Statements

The following required Method Statements (as relevant and if not already required in terms of the Contract) are to be provided and approved prior to Contractor's arrival on site

- **Emergency preparedness** – which shall address procedures and equipment for medical emergencies, runaway fires, environmental incidents, site evacuation and staff assembly.
- **Placement of Boreholes** – A method statement for each new borehole site must be prepared and must address the placement of the borehole, laydown areas or storage areas, method of drilling, chemicals to be used, bunding, water management and any specific measures identified by the specialist.
- **Site establishment** – which shall address Contractor's camp/s, lay-down or storage areas, site access and required infrastructure.
- **Ablution facilities** – which shall address washing facilities (including methods for managing grey water) and toilets (including the number of, location and method of securing portable/chemical toilets to the ground (if not trailer versions), the proposed service providers to remove and dispose of resultant waste and their service schedule).
- **Hazardous Chemical Substances** (as defined in the Regulations for Hazardous Chemical Substances in GN 179 (25 August 1995)), hydrocarbon substances (which includes all fuels and oils) or dangerous goods to be used – which shall address the storage, handling and disposal procedures of the materials.
- **Hydrocarbon spills** – which shall address the procedures, reporting and training required to address accidental spills.
- **Concrete Mixing and batching plants** – which shall address locations, bunding, and cement-laden water management.
- **Waste Management** – which shall address the type of waste anticipated; the storage, handling, reuse, recycling and/or disposal procedures proposed, together with the facilities proposed to receive such waste.

The following required Method Statements (as relevant and if not already required in terms of the Contract) are to be provided at least 14 calendar days prior to the programmed commencement date of the subject works or activity:

- No-Go area demarcation and access control within the approved development site/servitudes.
- Workshop and plant servicing.
- Vegetation clearing – including methods and areas for clearing and felling.
- Stockpile management – including proposed locations and erosion management.
- Access management – including proposed engagement with affected landowner/s, proposed routes, gates, and fencing, crossings, access control, existing services management.
- Working in watercourses or wetlands - access, crossings, dewatering activities.
- Heritage Resource protection within the development site.
- Traffic and Detour Management – lane closures, signalman, alternative routes, etc.

4.6.2 Additional Method Statements (on request)

Method statements may also be requested by the ECO or SE/Contract Manager as the need arises. The Contractor shall submit any additional Method Statements that arise within such reasonable time as the ECO or SE/Contract Manager shall specify.

4.6.3 Content

For each instance when it is required or requested that the Contractor submit a Method Statement to the satisfaction of the ECO, the format shall clearly indicate the following:

- Who:** Nominated representative and their assigned responsibilities (in relevant instances).
- What:** A brief description of the activity to be undertaken (and in relevant instances, the proposed variation from or deviation to the Contract Documentation, or this EMPr).
- How:** A detailed description of the work, methods, materials, or process proposed (and in relevant instances any reinstatement/rehabilitation requirements).
- Where:** A description/sketch map of the locality of work or layout proposed.
- When:** The sequencing of actions with due commencement dates and completion date estimates.

The Contractor (and, where relevant, any sub-contractors) must also sign the Method Statement, thereby indicating that the work will be carried out according to the methodology contained in the approved Method Statement. An example of a Method Statement form can be found in Annexure B.

4.7 Environmental Awareness training and staff induction

The Contractor shall ensure that all staff receive site environmental awareness and staff induction training in appropriate languages, as well as any refresher courses, pertaining to their role on the project, including that:

- All personnel (including sub-contractors) shall receive induction training on the Code of Conduct and project specific environmental awareness relating to the conditions of the EA and EMPr prior to commencing with any site activities.
- All personnel shall receive induction training on the emergency procedures to be followed in the event of an emergency (e.g. staff assembly and site evacuation, medical emergencies, the locations and basic use of fire extinguishers, first aid kits and spills kits, and the use of safety equipment (where relevant)).
- Relevant staff (including sub-contractors) shall receive induction training on landowner considerations, including access and transport routes on each property, gate management, communication expectations, etc.
- Relevant staff (including sub-contractors) shall receive induction training by a professional and suitably experienced archaeologist and/or to ensure that all persons working on the wind farm site are familiar with the types of heritage resources that may be exposed during construction and the necessary steps to follow in the event that archaeological resources are unearthed. Refer to the fossil finds protocol.
- All personnel (including sub-contractors) shall receive regular toolbox talks and refresher courses on the induction material, and project specific environmental awareness for the duration of the contract, including “lessons learnt” to prevent recurring issues.

The SE/Contract Manager and Contractor will conduct environmental induction training with personnel and must address, amongst others:

- Explanation of the environmental process that preceded the EA and why it was important to conduct the environmental process;

- Explanation of the conditions of authorisation contained in the EA;
- The sensitive environmental features located within and around the site;
- The reasons why mitigation measures are required and the benefits of implementing these measures;
- The EMPr and its contents (e.g. no-go areas, animals, littering etc.); and
- The role of the ECO.

An example of an Environmental Awareness and Induction Training Course is included in Annexure C for the ECO's consideration.

4.8 Temporary site closure

If the site is closed for a period exceeding one week during the construction or decommissioning phase, the Contractor, in consultation with the ECO shall carry out the following checklist procedure.

- Hazardous materials stores
 - Outlet secure/locked
 - Bund(s) empty (where applicable)
 - Fire extinguishers serviced and accessible
 - Emergency and responsible personnel contact details displayed on site
 - Adequate ventilation in hazardous substance stores
- Safety
 - All trenches and manholes secured and closed
 - Fencing and barriers in place
 - Material packs (e.g. pile of pipes) secured
 - Access gates locked and secured
- Erosion
 - Wind and dust mitigation in place
 - Slopes and stockpiles at stable angle
 - Open soil re-vegetated or stabilised
- Water contamination and pollution
 - Cement and hazardous materials stores secured
 - Toilets empty and secured
 - Refuse bins empty and secured
 - Drip trays empty and secured (where possible)
 - Structures vulnerable to high winds secured

4.9 Record Keeping

All records and documents relating to the implementation of this EMPr shall be retained, shall be easily retrievable for the duration of the Contract, and shall be filed by the Contractor for a minimum of 12 months after cessation of activities. These records and documents must be made available to the SE/Contract Manager, ECO and/or relevant authority upon request.

These records and documents shall include (but shall not be limited to) the most recent versions of:

- The Environmental Authorisation.
- Permits, licenses and registrations.
- The EMPr and any associated management plans.
- EIRF and Complaints Register.
- Approved Method Statements.
- Staff induction and environmental training material and attendance registers.
- Checklists for temporary site closure.
- Monthly compliance reports prepared by the ECO.
- Certificates of disposal.
- Disciplinary action (including time penalties or monetary fines) for environmental transgressions.
- Independent Environmental Audits.

5 Environmental Management Plan

This chapter sets out the necessary practical mitigation measures to be undertaken to address the activities and potential impacts identified and assessed in the EIR, and summarised in 3.1. The sections below provide the mitigation measures for each project phase, i.e. pre-construction, construction, operation and decommissioning. The final section of the EMPr provides a checklist of tasks to be undertaken in the case of temporary site closure (e.g. Builders' Holidays).

In the sections below, a table has been created for each identified activity, which provides the following information:

Activity	Describes the action to be undertaken by the implementer.
Objective	Describes the goal of environmental management, if the mitigation measures are implemented.
Potential impact	Lists the potential impacts that have been identified by the specialists during the impact assessment of the EIR. The symbols that follow the impact indicate if it is a negative impact or a positive impact.
Mitigation measures	Measures provided by the EAP and specialists to reduce potential negative impacts and enhance potential positive impacts. These measures have been broken into rows that separate responsibility, and refer to different site actions (e.g. site demarcation and vegetation clearing).
Responsibility	Each action will fall under the responsibility of one of the role-players listed in 4.1 and 4.2.
Timeframe	An indication of when the actions must take place is provided.
Monitoring method and frequency	This section highlights the monitoring activities required by the ECO or other responsible party.

5.1 Pre-construction phase

Mitigation measures (impact management actions)	Responsibility	Implementation Timeframe	Monitoring
Specialist Mitigation measures			
TERRESTRIAL ECOLOGY			
The ecologist must ensure that the final designs, i.e. the final footprints are located outside of any sensitive areas such as depressions, rock outcrops, especially the temporary construction areas, noting the close proximity of Turbine 35 to a dolerite outcrop.	Proponent/Engineer	Once-off during the design phase.	-
Implement the Plant and Animal Search and Rescue Plan prior to any construction activities with the requisite permits in place as supplied by the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.	Proponent/Engineer	Once-off during the design phase.	ECO- as per schedule
BATS			
Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. These areas are delineated in the bat sensitivity map. Turbines must not be placed in high sensitivity areas, and curtailment measures outlined in section 7 of the specialist report must be applied to turbines within medium sensitivity areas as soon as turbines are functional.	Proponent/Engineer	Once-off during the design phase.	-
The height of the lower blade swept area must be maximised.	Proponent	Once-off during the design phase	-
AQUATIC ECOLOGY			
A pre-construction walkthrough with an aquatic specialist is recommended and they can assist with the development of the stormwater management plan and Rehabilitation and Monitoring plan. A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems.	Proponent/Engineer	Once-off during the design phase.	-
AGRICULTURE			
Design an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely	Proponent/Engineer	Once-off during the design phase.	-

disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion. Ensure the storm water run-off control is included in the engineering design			
SOCIO-ECONOMIC			
Before the construction phase commences the proponent should meet with representatives from the Hantam LM to establish the existence of a skills database for the area. If such a database exists it should be made available to the contractors appointed for the construction phase.	Proponent/Engineer	Once-off during the design phase.	-
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.	Proponent/Engineer	Once-off during the design phase.	-
TRANSPORT			
Abnormal Vehicle route identification and assessment including road infrastructure assessment and proposals (to be undertaken during detailed planning phase pre-construction)	Proponent/Engineer	Design phase.	-
A Pre and Post road condition assessment of the Granaatboskolk Road used to site	Proponent/Engineer	Design phase.	-
WAKE LOSS			
The final turbine model must be selected with due consideration to minimizing wake effects to the Khobab and Loeriesfontein Wind Farms, as far as reasonably possible.	Proponent	Once-off during the design phase.	-
Signed Wake Loss Agreements must be concluded with the Khobab and Loeriesfontein Wind Farms, in terms of which the Khobab and Loeriesfontein Wind Farms will be compensated from wake loss caused by the Kokerboom 3 WEF.	Proponent	Once-off during the design phase.	-
AVIFAUNA			
A 300m no-go buffer zone (all infrastructure) should be implemented around the Pale Chanting Goshawk nest at 30°21'29.26"S 19°34'26.81"E.	Operator	Once-off during the design phase	-
No-turbine buffer zone, starting from the edge of the pan, must be implemented around the following pans: Pan 1: 30°20'34.17"S 19°28'5.19"E (800m) Pan 2: 30°19'44.15"S 19°31'31.61"E (800m) Pan 3: 30°21'0.25"S 19°32'23.08"E (500m) Pan 4: 30°21'47.87"S 19°33'42.41"E (800m)	Proponent / Operator	Once-off during the design phase	-
A 1km broad turbine-free corridor must be implemented between the pans in the following manner: Pan 1 to Pan 2, Pan 2 to Pan 3, Pan 3 to Pan 4.	Proponent/ Engineer	Once-off during the design phase	-

ELECTROMAGNETIC AND RADIO FREQUENCY INTERFERENCE			
Due to the 96.68km distance between Kokerboom 3V1-53 and SKA008, the closest SKA unit, a degradation of performance is expected unless the radiated emissions from each turbine installation can be reduced by 32dB below the CISPR 11 Class B limit across the 100MHz to 6GHz band, by the implementation of suitable mitigation measures (i.e. shielding, filtering, insulation or other attenuation measures).	Proponent	Once-off during the design phase	-
Such mitigation measures must be integrated into the detailed design for the wind farm, once the final turbine technology has been selected. This assessment has considered the worst case scenario. Should the final selected turbine have a hub height less than 150m, or if the turbine emissions are less than the CISPR 11 Class B limits, then less mitigation would be required. This should be confirmed during the detail design phase, prior to construction.	Proponent	Once-off during the design phase	-
Compliance is achieved when the SARAS Protection level [1] is not exceeded at the SKA Infrastructure location. Certain conditions, such as a separation distance >50km for windfarms would exempt a development from applying for a permit under [1] unless it is found that radio frequency interference is caused.	Proponent	Once-off during the design phase	-
General			
Compliance and auditing			
Appoint a suitably qualified independent ECO. This person should have appropriate experience of environmental management, and a good understanding of local fauna and flora. The ECO should be made aware of the potential occurrence of scientifically important fossil remains within the development footprint. The ECO should be able to make clear recommendations with regard to the management of disturbed areas.	Proponent/ECO	Tender For duration of the construction period	-
Method statements			
<ul style="list-style-type: none"> Method Statements must be submitted and approved prior to site establishment commencing. The content and required actions of the Method Statements must be communicated to site staff through the compulsory induction training. Refer to Section 4.6 for the list of Method Statements required. 	Submitted by Contractor, approved by ECO	Prior to site establishment	ECO- as per schedule
Monitoring method and frequency			
Prior to the start of the construction period, the appointed ECO should confirm that the above-mentioned measures have been considered, and where possible implemented.			ECO- as per schedule

The ECO shall undertake a pre-construction audit with photographic record of the condition of vegetation, watercourses and existing impacts within the construction footprint. This will be considered as the baseline for the project.			
An approved construction footprint will be issued by the Engineer as a formal drawing. The Contractor shall request a formal revision of the drawing should a larger working/ construction area be required. The revision may only be issued subject to consultation with and written agreement from the ECO. The contract documentation shall make allowance for penalties in the case of negligence by the Contractor to comply with the requirements of the EMPr and to remain within the approved construction footprint.			
Should a plant search and rescue be required, the ECO or appointed sub-contractor shall record the types of species collected as well as the number of specimens collected, the habitat they were removed from and their general condition			
Where required, a Plant Rescue and Protection Plan should be submitted to the ECO for approval.			
Mitigation measures	Responsibility	Implementation Timeframe	
Code of conduct			
<ul style="list-style-type: none"> • The Contractor must develop a project specific Code of Conduct in consultation with representatives from the Monitoring Forum (if applicable). The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed or subject to strict disciplinary action. All dismissals must comply with the South African labour legislation. • The Code of Conduct must be signed by the proponent and contractor before contractors move onto site. • The Code of Conduct, shall as a minimum include the following considerations: <ul style="list-style-type: none"> ○ No workers are permitted to trespass onto adjacent properties. ○ Employees of this project who are found guilty of stealing livestock and/ or damaging farm infrastructure must be dismissed and charged. ○ Waste management measures must be followed (detailed in Management of Construction Camp. Any employee found to be littering either on site, or whilst being transported to and from site should be fined. ○ Should a fire event be proven to be caused by a member of the project team and/or construction activities, the appointed Contractor will be liable to compensate the farm for any damage caused to their farm. 	Contractor/ Monitoring Forum	Project lifecycle	ECO- as per schedule

<ul style="list-style-type: none"> ○ All vehicles must be road-worthy and drivers must be qualified and licensed. The drivers must be made aware of the potential road safety issues and the need for strict speed limits. ○ The Contractor must liaise with the affected farmers regarding the timing and location of construction activities so that they can make alternative arrangements for their sheep. ● Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. 			
Training and awareness			
<ul style="list-style-type: none"> ● Preconstruction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to. This includes awareness of harm caused by littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc. The proponent and contractor should also implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase. ● Appropriate emergency training (e.g. firefighting) must be given to team prior to the construction period. ● The need to implement a training and skills development programme for local workers should be investigated prior to the initiation of the construction phase. The aim of the programme would be to maximise local employment opportunities. ● Ensure that noise as a component is included in the induction of employees and contractors, and how their activities and actions can impact on residents in the area (reverse alarms and reversing close to dwellings, driving fast past residential dwellings at night, maintenance of equipment). All contractors and employees should receive this induction. ● The Contractor must provide appropriate fire-fighting equipment on site, and ensure that selected construction staff are appropriately trained for fighting fires. ● The project should be used to promote and increase the contribution of renewable energy to the national energy supply. 	Contractor/ ECO	During site establishment	ECO- as per schedule
Monitoring			

Prior to the start of the construction period, the appointed ECO should confirm that the above-mentioned measures have been considered, and where possible implemented.	ECO- as per schedule
The details of the Monitoring Forum (if applicable) and Code of Conduct must be made available to the ECO, and a copy must be kept on site for the duration of the construction phase.	ECO- as per schedule
All relevant Method Statements should be provided to the ECO for review and approval prior to construction commencing.	ECO- as per schedule

5.2 Construction Phase

Mitigation measures (impact management actions)	Responsibility	Implementation Timeframe	Monitoring
Specialist Mitigation Measures			
TERRESTRIAL ECOLOGY			
The ecologist must ensure that the final designs, i.e. the final footprints are located outside of any sensitive areas such as depressions, rock outcrops, especially the temporary construction areas, noting the close proximity of Turbine 35 to a dolerite outcrop.	Proponent/ Contractor	Pre-construction	ECO- as per schedule
Implement the Rehabilitation and Monitoring plan that forms part of the EMPr	Contractor	All phases of the project	ECO- as per schedule
Implement the Plant and Animal Search and Rescue Plan prior to any construction activities with the requisite permits in place as supplied by the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.	Contractor	Pre-construction and construction	ECO- as per schedule
Implement the alien management plan, during the construction phase. The management should then continue into all future phases of the project.	Contractor	Pre-construction and construction	ECO- as per schedule
BATS			
It may be possible to limit roost abandonment by avoiding construction activities near roosts. No confirmed roosts have been found on site but there are potential roosts that bats may be using including trees, rocky crevices, and buildings.	Contractor/ Proponent/ Engineer	Construction phase	ECO- as per schedule
It is recommended that construction activities are limited as much as possible in areas identified as high and medium sensitivity of the bat sensitivity map.	Contractor	Construction phase	ECO- as per schedule
The WEF must be designed and constructed in such a way as to avoid the destruction of potential and actual roosts, particularly trees, rocky crevices (if blasting is required) and buildings. It is recommended that construction activities are limited as much as possible in areas identified as medium sensitivity of the bat sensitivity map. Blasting/removal	Contractor	Construction phase	ECO- as per schedule

of trees/removal of pre-existing buildings is prohibited within high bat sensitivity areas.			
Before destruction of features with possible roosts, the ECO needs to investigate the area so as to establish whether there is a bat roost. The ECO must be in contact with the bat specialist so as to be instructed what to look for. If a roost is found, a bat specialist must be contacted before further disturbance of the roost.	Contractor/ ECO	Pre-construction/construction	ECO- as per schedule
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction should, where possible, be situated in areas that are already disturbed.	Contractor/ ECO	Construction phase	ECO- as per schedule
This impact must be reduced by limiting the removal of vegetation, particularly trees, as far as possible.	Contractor/ ECO	Construction phase	ECO- as per schedule
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the EMPr.	Contractor/ ECO/Engineer	Post-construction	ECO- as per schedule
All roofs of new buildings must be carefully sealed off so that no bats can start new roosts in the buildings; keeping in mind that some bat species, such as <i>Neoromicia capensis</i> , could enter at a hole the size of a finger. Sealing of roofs should be maintained throughout the lifespan of the wind farm.	Contractor/ ECO/Engineer	Construction phase	ECO- as per schedule
All excavation areas or artificial ditches formed during construction must be filled and rehabilitated so that no new open water sources are created during rainy periods.	Contractor/	Construction phase	ECO- as per schedule
AVIFAUNA			
Restrict the construction activities to the construction and decommissioning footprint area.	Contractor/ ECO	Construction phase	ECO- as per schedule
Do not allow any access to the remainder of the property during the construction period.	Contractor/ ECO/Engineer	Construction phase	ECO- as per schedule
For the construction period, a 200m exclusion zone should be implemented around the existing water points where no construction activity or disturbance should take place. There is one exception to this condition namely a new site road	Contractor/ ECO/Engineer	Construction phase	ECO- as per schedule

that will be constructed parallel to the public road on the other side of the road from the water point, on Portion 1 of Farm 214.			
A 300m exclusion zone should be implemented around the Southern Pale Chanting Goshawk nest at 30°21'29.26"S 19°34'26.81"E	Contractor/ ECO/Engineer	Construction phase	ECO- as per schedule
To prevent unnecessary habitat destruction (i.e. more than is inevitable), the recommendations of the specialist ecological study must be strictly adhered to. It is especially important that maximum use is made of existing roads.	Contractor/ ECO	Construction phase	ECO- as per schedule
AQUATIC			
All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings. Prosopis (alien invasive tree) is prevalent in areas to the south of the site, thus care in transporting any material, while ensuring that such materials is free of alien seed, coupled with pre and post alien clearing must be stipulated in the EMPr.	Contractor/ ECO	Construction phase	ECO- as per schedule
Where roads and crossings are upgraded, the following applies: <ul style="list-style-type: none"> – All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised. – 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 pre-construction walkdown. – Where large cut and fill areas are required these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation. – Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc). 	Contractor/ ECO	Construction phase	ECO- as per schedule

Any dust suppression must be kept to a minimum, to prevent the formation of pools, or runoff that may then contain pollutants.	Contractor/ ECO	Construction phase	ECO- as per schedule
All liquid chemicals including fuels and oil, including the BESS must be stored in secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.	Contractor/ ECO	Construction phase	ECO- as per schedule
Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).	Contractor/ ECO	Construction phase	ECO- as per schedule
Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.	Contractor/ ECO	Construction phase	ECO- as per schedule
All construction camps lay down areas, wash bays, batching plants or areas and any stores should be more than 50 m from any demarcated water courses.	Contractor/ ECO	Construction phase	ECO- as per schedule
Littering and contamination associated with construction activity must be avoided through effective construction camp management.	Contractor/ ECO	Construction phase	ECO- as per schedule
No stockpiling should take place within or near a water course	Contractor/ ECO	Construction phase	ECO- as per schedule
All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.	Contractor/ ECO	Construction phase	ECO- as per schedule
HERITAGE (INCLUDING ARCHAEOLOGY)			
The grade GPA archaeological site at waypoints 722, 1938 and 1939 will require archaeological mitigation in the form of sampling and collection. Mitigation of the artefact scatters at waypoints 722, 1938 and 1939 would involve establishing a grid of metre squares and collecting all archaeological material in each square. Material would be scraped up from each square, sieved and sorted to extract the artefacts and other archaeological materials. These finds would be analysed and described in a report and the material would be stored in perpetuity in the provincial museum, in this instance the McGregor Museum, Kimberly.	Contractor/ Proponent/ ECO	Construction phase	ECO- as per schedule

Because of the process that needs to be followed, it is recommended that mitigation, if needed, should be commissioned as far in advance of construction as possible (at least six months in advance of construction being ideal, if construction timelines provide for this).			
The grade IIIB archaeological site at waypoints 717 to 719 should be demarcated by the ECO as a no-go area and must be monitored throughout the construction period to ensure that it is not damaged. The ECO should, in general, ensure that no activities take place outside of the authorised construction footprint.	ECO	Construction phase	ECO- as per schedule
Restrict all construction activities to the demarcated project footprint.	Contractor/ECO/Engineer	Construction phase	ECO- as per schedule
Educate construction staff to understand the importance of remaining within the authorised footprints for all roads, turbine placements and other aspects of the development.	Contractor/ECO	Construction phase	ECO- as per schedule
If any archaeological material or human burials are uncovered during the course of development, then the find should be protected from further disturbance and work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Contractor/ECO/Engineer	Construction phase	ECO- as per schedule
SOCIO-ECONOMIC			
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.	Contractor/Proponent	Construction Phase	-
Where feasible, efforts should be made to employ suitably qualified and experienced local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.	Contractor/ Proponent	Construction Phase	-
Before the construction phase commences the proponent should meet with representatives from the Hantam LM to establish the existence of a skills database	Contractor/Proponent	Pre-Construction Phase	-

for the area. If such a database exists it should be made available to the contractors appointed for the construction phase.			
The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	Contractor/ Proponent	Construction Phase	-
The need to implement a training and skills development programme for local workers should be investigated prior to the initiation of the construction phase. The aim of the programme would be to maximise local employment opportunities.	Contractor/ Proponent	Construction Phase	-
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	Contractor/ Proponent	Construction Phase	-
The proponent should liaise with the Hantam LM with regard to 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;	Contractor/ Proponent	Construction Phase	-
Where possible and permissible in terms of fair procurement policies, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	Contractor/ Proponent	Construction Phase	-
Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi- and low-skilled job categories.	Contractor/ Proponent	Construction Phase	-
The proponent should consider the need for establishing a Monitoring Forum in order to monitor the construction phase and the implementation of the recommended mitigation measures. The Forum should be established before the construction phase commences, and should include key stakeholders, including representatives from the Hantam LM, farmers and the contractor(s). The Monitoring Forum should also be briefed on the potential risks to the local community and farm workers associated with construction workers.	Contractor/ Proponent	Construction Phase	-

The proponent and the contractor(s) should, in consultation with representatives from the Monitoring Forum, if applicable, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed or subject to suitable disciplinary action. All dismissals must comply with the South African labour legislation.	Contractor/ Proponent	Construction Phase	-
The proponent and contractor(s) should implement an HIV/Aids awareness programme for all construction workers at the outset of the construction phase.	Contractor/ Proponent	Construction Phase	-
No workers should be permitted to trespass onto adjacent properties. Failure to adhere to this should be made a dismissible offence.	ECO/Contractor	Construction Phase	ECO- as per schedule
In the event of workers being accommodated in Loeriesfontein or another remote location off site, the contractor should provide transport to and from the site on a daily basis for workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site.	Contractor	Construction Phase	-
Where necessary, the contractors should make the necessary arrangements to enable workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.	Contractor	Construction Phase	-
The need and feasibility of establishing accommodation on site should be assessed by the proponent.	Contractor/ Proponent	Construction Phase	-
If accommodation on site is not required and/or feasible it is recommended that no construction workers, with the exception of security personnel, be permitted to stay over-night on the site. However, some staff may be accommodated in houses located on local farms in the area, by prior agreement with the landowners concerned.	Contractor	Construction Phase	-
The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.	Contractor/ Proponent	Construction Phase	-
The proponent should implement a policy that no employment will be available at the gate.	Contractor/ Proponent	Construction Phase	-

<p>The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for, if evidence can be provided. The contractor may be liable for such compensation costs, as per the contract between the proponent and the contractor/s.;</p>	Contractor/ Proponent	Construction Phase	-
<p>No workers should be permitted to trespass onto adjacent properties. Failure to adhere to this should be made a dismissible offence, or subject to strict disciplinary action. In this regard contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;</p>	Contractor/ Proponent	Construction Phase	-
<p>Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;</p>	Contractor	Construction Phase	-
<p>The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This forum/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;</p> <p>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 and the contractors. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);</p>	Contractor/ Proponent	Construction Phase	-
<p>The Environmental Management Programme (EMPr) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;</p>	EAP/ECO	Pre-Construction Phase	ECO- as per schedule

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;	Contractor/ ECO/ Proponent	Construction Phase	ECO- as per schedule
It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. However, it is recognised that there may need to establish accommodation on site. If this is the case then the movement of workers should be contained to the construction camp area.	Proponent/Contractor	Construction Phase	-
Contractor/s should ensure that no open fires are allowed on the site;	Contractor	Construction Phase	-
Contractor to 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;	Contractor	Construction Phase	-
Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard, special care should be taken during the high risk dry, windy summer months	Contractor/Engineer	Construction Phase	-
Contractor should provide adequate fire-fighting equipment on-site;	Contractor	Construction Phase	-
Contractor should provide fire-fighting training to selected construction staff;	Contractor	Construction Phase	-
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 should compensate farmers for any damage caused to their farms.	Contractor	Construction Phase	-
As far as possible, the transport of components to the site along the N7 should be planned to avoid weekends, holiday periods and the Spring Flower (typically August-September) season if possible.	Contractor/ Engineer	Construction Phase	-
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;	Contractor	Construction Phase	-
The contractor must ensure that damage caused by construction related traffic to the Nuwepos (Granaatboskolk) Road and local farm roads is repaired on a regular	Contractor	Construction Phase	-

basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;			
All vehicles must be road-worthy and drivers must be licensed and made aware of the potential road safety issues and need for strict speed limits;	Engineer/Contractor	Construction Phase	-
The Contractor should liaise with the affected farmers regarding timing and location of construction activities so they can make alternative arrangements for their sheep;	Contractor	Construction Phase	-
The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;	Contractor	Construction Phase	-
The Contractor should be required to collect waste along the access road on a weekly basis;	Contractor	Construction Phase	-
Waste generated during the construction phase should be transported to the local landfill site or other appropriate recycling/disposal facility.	Contractor	Construction Phase	-
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.	Contractor/ ECO	Pre-Construction Phase	ECO- as per schedule
An ECO should be appointed to monitor the establishment of the construction phase.	Proponent	Construction Phase	-
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area, etc., should be rehabilitated at the end of the construction phase except where such facilities are required during the operational phase. The rehabilitation plan should be informed by input from an appropriately qualified professional, with experience in arid regions.	Contractor	Construction Phase	-
The implementation of a Rehabilitation Programme should be included in the terms of reference for the contractor(s) appointed.	Proponent	Construction Phase	-
The implementation of the Rehabilitation Programme should be monitored by the ECO.	Contractor/ ECO/ Proponent	Construction Phase	ECO- as per schedule

NOISE			
There is a potential for a noise impact if multiple construction activities take place within 2 000 m from the identified NSD. By only allowing the construction of a WTG at one location (within 2 000 m from the house at Struiskom) at a time, the developer can ensure that the significance of the noise impact would be low. Construction activities close to this NSD can be planned during a period when the house is not used. Note that if Struiskom (NSD) is not occupied at the time of construction, then the noise impact would not arise and there would be no limitation on night-time construction activities within 2000m of the NSD.	Contractor	Construction	
Significance of noise impact is very low for the scenario as conceptualized. It is however recommended that roads not be constructed within 150 m from occupied dwellings used for residential purposes (to reduce noise levels below 42 dBA if construction traffic may use the road at night).	Contractor/ Proponent	Construction phase	-
VISUAL			
Dust suppression measures to reduce dust generated by moving vehicles and earth cleared of vegetation. Signage on the Nuwepos Road should be moderated (approximately 1m high x 1.5m wide) and natural colours used in the signage as much as possible.	Contractor	Construction phase	-
The buildings should be painted a suitable colour in keeping with the surrounding landscape e.g. grey-brown or light brown) or built of materials (e.g. brickwork) in keeping with the colour of the surrounding landscape to assist in reducing colour contrast.	Contractor/ Proponent/Engineer	Construction phase	-
Fencing should be simple and appear transparent from a distance. The fences should be checked monthly for the collection of litter caught on the fence.	Contractor/ Proponent/Engineer	Construction phase	-
Soil erosion measures need to be adequately implemented and routinely monitored by the ECO. Dust suppression to reduce dust from moving vehicles when required (Decommissioning phase).	Contractor/ECO	Construction phase	ECO- as per schedule
TRANSPORT			

Road maintenance & monitoring plan for the construction phase, for public roads (like Granaatboskolk Road) as well as internal site roads	Contractor / Engineer	Construction phase	ECO- as per schedule
Clear information published to public regarding dates, times and routes of abnormal vehicle transportation through various towns	Contractor	Construction phase	-
Clear information published to public regarding risks associated with driving near or behind abnormal roads	Contractor	Construction phase	-
Site accesses to be sufficiently large to safely accommodate turning radius of abnormal vehicle	Contractor	Construction phase	-
Adequate warning signage of construction and abnormal vehicles in advance of site access point	Contractor	Construction phase	ECO- as per schedule
AGRICULTURE			
Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.	Contractor / ECO	Every 2 months during the construction phase	ECO- as per schedule
Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	ECO/ Contractor	Every 2 months during the construction phase	ECO- as per schedule
Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.	Contractor/ ECO	Every 4 months during the construction phase	ECO- as per schedule
Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation.	ECO		ECO- as per schedule
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.	Contractor/ ECO	As required, whenever areas are disturbed.	ECO- as per schedule

Record GPS positions of all occurrences of below-surface soil disturbance (e.g. excavations). Record the date of topsoil stripping and replacement. Check that topsoil covers the entire disturbed area	Contractor/ ECO		
PALAEONTOLOGY			
<p>All major clearance operations (e.g. for new access roads, turbine placements) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ECO and on-site Environmental Officer (EO). Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO or EO should safeguard these, preferably in situ. They should then alert the South African Heritage Resources Agency, SAHRA, as soon as possible (Contact details: Dr Ragna Redelstorff, Heritage Officer Archaeology, Palaeontology & Meteorites Unit, SAHRA. 111 Harrington Street, Cape Town, 8001. Tel: +27 (0)21 202 8651. Fax: +27 (0)21 202 4509 E-mail: rredelstorff@sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the proponent's expense.</p> <p>The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).</p>	ECO/ Contractor	Construction	ECO- as per schedule
Strictly follow the chance fossil finds procedure as indicated in section Annexure D			
General			
Site and road demarcation			
<ul style="list-style-type: none"> All construction areas must be clearly demarcated. For general demarcation (i.e. construction footprint), it is recommended that brightly 	Contractor/ ECO	Construction Phase	ECO- as per schedule

<p>painted white pegs/ poles reaching a height of 1.5m be placed at 5 to 10m intervals. The use of danger tape or orange netting or similar shall only be used to demarcate high risk areas (in terms of health and safety, or environmental sensitivity).</p> <ul style="list-style-type: none"> • If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside. • The construction camp area must be fenced off in such a way that access is controlled to avoid trespassers. • Signage (refer to Environmental Awareness Section) must be erected at all site access points and shall comply with all applicable occupational health and safety requirements. • Any potentially dangerous fauna such as snakes or fauna threatened by the construction activities should be removed to a safe location. • Do not allow movement of people to the rest of property during the construction period. This will limit the disturbance of the natural environment to the construction footprint. • No vehicular trampling of veld vegetation beyond road footprint. • Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However caution should be exercised to avoid using material that might entangle fauna. 			
Vegetation clearing and topsoil			
<ul style="list-style-type: none"> • Cleared vegetation may not be disposed of as waste at a landfill site. • Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise impacts when rainfall does occur. 	Contractor/ ESO/ ECO	Construction Phase	ECO- as per schedule

<ul style="list-style-type: none"> • Where possible, a low cover of vegetation should remain within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover. • To facilitate revegetation of denuded areas, topsoil should be stockpiled with seedbanks intact as far as possible, for use in the rehabilitation phase. • Any excavation, including those for cables, must be supervised by the ECO or ESO (or undertaken in accordance with an approved method statement). Disturbance of vegetation and topsoil must be kept to a practical minimum. • Strip and stockpile topsoil from all areas where soil will be disturbed below surface. It is not necessary to strip topsoil from the whole development area, if the soil below surface is not being disturbed. • All soil above the rock or hardpan should be stripped (to a maximum depth of 25cm) and stockpiled. Any additional soil overburden from below that depth must be stripped and stockpiled separately. • Maintain stockpile shape and protect from erosion. Limit the height of stockpiles as far as possible in order to reduce compaction. • All stockpiles must be positioned at least 32m away from watercourses, unless agreed otherwise with the ECO. 			
Stormwater management			
<ul style="list-style-type: none"> • Where required (such as areas where water may accumulate), implement an effective system of stormwater run-off control using berms (raised, low walls of soil) and ditches. • The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and must prevent any potential down slope erosion. • Site inspection must assess the effectiveness of the run-off control system and specifically record the occurrence (or not) of any erosion on site or downstream. 	Contractor	Monthly during construction	ECO- as per schedule

Dust management			
<ul style="list-style-type: none"> As far as possible, stockpile dust generating materials away from areas where dust will be a nuisance or hazard. Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. Dust generation must be visually monitored on a daily basis and control measures must be implemented when excessive dust generation occurs. Control dust as per standard construction site measures which may include damping down with water or other appropriate and effective dust control measures. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site. Windblown dust during construction should be monitored by the ESO and ECO. Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under authorisation of the ECO. 	Contractor/ ESO	Project Lifecycle	ECO- as per schedule
Monitoring method and frequency			
The ECO and/or ESO must be present during periods of excavation, vegetation clearance and site demarcation to monitor activities.			ECO- as per schedule
The ECO shall undertake weekly inspections of the construction works to monitor compliance with the abovementioned mitigation measures. The frequency of inspections can be reduced (i.e. to monthly) should a permanent ESO be on site on a full time basis.			
Any faunal fatalities or incidents must be recorded and reported to the ECO.			
The ECO should monitor the occurrence of any off-road vehicle tracks during construction.			
During construction dust generation must be visually monitored on a daily basis and control measures must be implemented when excessive dust generation occurs. Daily dust monitoring may be undertaken by the Construction Contractor's Environmental Officer and/or the Managing Engineer's Site Manager. The ECO must also monitor dust generation during each ECO site inspection.			
A Plant Rescue and Protection Plan should be submitted to the ECO for approval, if search and rescue is required.			
Behavior within the construction camp footprint			

<ul style="list-style-type: none"> • Locks on service gates should be installed to prevent unauthorised access. • No dogs or cats (or other domestic animals) should be allowed on site, except for the landowner and lawful occupants. • 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 far as possible, which do not attract insects. These should be directed downwards. • All waste must go into the waste streams described below in Waste Management. No littering will be tolerated, as bits of plastic can be ingested by livestock and cause serious harm. • Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised. These may not occur within drainage lines. • No smoking shall be permitted near the storage of fuel and hazardous substances. Relevant signage shall be displayed. • Strict control over the behaviour of construction workers, as it relates to the use, storage and disposal of hazardous substances and other pollutants when any work is required within any of the proposed crossings. • 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. Hazardous materials must be stored in compliance with material safety datasheet (MSDS) files, as defined by the ECO. • All stored hazardous materials to be maintained within a bund and on a sealed surface. These storage areas must be inspected regularly to ensure bund stability, integrity and function. • Containers with a volume of more than 20ℓ must have proper dispensing equipment. • A spill kit able to contain 200ℓ must be kept at the construction camp. The spill kit must be fully stocked and easily accessible to the relevant, trained staff. • The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately banded, and stored in compliance with 	Contractor	Construction phase	ECO- as per schedule
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<p>material safety datasheet (MSDS) files, as defined by the safety, health and environment (SHE) Representative / ECO.</p> <ul style="list-style-type: none"> • Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals must be complied with. • Construction machinery must be stored in an appropriately secured area. • During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person. • No open fires should be allowed within the site as there is a risk of runaway veld fires. • Construction machinery must be inspected daily prior to commencement of works to detect any obvious hydrocarbon leaks. No maintenance of equipment shall take place outside of the construction camp. All maintenance shall be undertaken over a drip tray or on an impermeable surface. • Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils. • Leaking equipment shall be repaired immediately or removed from the site. • The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • Personnel should not be allowed to wander off the construction site. • No unauthorized persons should be allowed onto the construction camp site and site access should be strictly controlled. • Storage areas must be located more than 32m away from a watercourse, unless agreed otherwise with the ECO. 			
Behavior outside the construction camp footprint			
<ul style="list-style-type: none"> • The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • Personnel should not be allowed to wander off the construction site. 	Contractor	Construction phase	ECO- as per schedule

<ul style="list-style-type: none"> • All vehicles accessing the construction site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • No fuelwood collection should be allowed on site. • Farm gates should always be secured or as per the land owner's wishes. Livestock should not be allowed to leave the property. • No litter may be thrown out of windows during travel to and from site. A weekly clean up must be undertaken along the access road if litter is present. • The Contractor shall take all reasonable measures to ensure the safety of people in the surrounding area, in terms of traffic and movement of people. • Employee behaviour must be in line with the Code of Conduct (developed during the pre-construction phase). Construction workers in breach of the code should be dismissed or suitably disciplined. All dismissals must comply with the South African labour legislation. • Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be enforced. • All vehicles must stay on roads or existing tracks. Any transgressions will be finable as this reduces the availability of grazing land for the farmer. • An incident/complaints register must be established and maintained on-site. • Corrective action must be undertaken immediately if a valid complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. 			
Ablution facilities			
<ul style="list-style-type: none"> • Appropriate ablution facilities must be provided for construction workers during construction in accordance with the Occupational Health and Safety Act (Act 85 of 1998) (OHS). • The Contractor may not allow temporary toilets to be erected within 100m of watercourses or wetland areas, unless agreed otherwise with the ECO. • Toilets shall be in a ratio of 1 toilet for every 15 workers, or as per the OHS. 	Contractor	Construction phase	ECO- as per schedule

<ul style="list-style-type: none"> Toilets shall be secured to the ground. The Contractor shall ensure that all chemical toilets are cleaned and emptied regularly, especially prior to any temporary site closure or long weekend. Proof of disposal of portable toilet content at a waste water treatment works must be retained on site. 			
Management against erosion and sedimentation			
<ul style="list-style-type: none"> Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Windbreaks and sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other soil waste heaps present during the wet season. 	Contractor	Construction phase	ECO- as per schedule
Waste management			
<ul style="list-style-type: none"> Potential sources of waste pollution must be used responsibly and strictly managed on site. An integrated waste management approach in accordance with the Waste Management Hierarchy must be implemented on site. This should aim to avoid, reduce, reuse, recycle, recover and treat waste where possible, where disposal is the last resort. Construction contractors must provide specific detailed waste management plans to deal with all waste streams. Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control. Where possible, construction and general waste on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc.). Supply waste collection bins at construction equipment and construction crew camps. In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of 	Contractor	Construction phase	ECO- as per schedule

<p>emergencies/incidents and the contaminated soil should be disposed of at a registered hazardous waste facility. Proof of disposal should be supplied to the ECO.</p> <ul style="list-style-type: none"> • Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal or storage (for surplus goods). • All containers must have lids and be stored in a covered and bunded area or in a flammable/ hazardous store with a metal drip tray able to contain 110% of the volume of the largest container. • Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. • Any storage and disposal permits/ approvals which may be required, must be obtained, and the conditions attached to such permits and approvals must be complied with. • Waste disposal records must be available for review at any time. Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste. • Under no circumstances may solid waste be burnt or buried on site. • Any contaminated water must be contained by means of careful run-off management. Any accumulated contaminated water (e.g. oil water from bunds) must be removed from site by licensed contractors. • Any spills must receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan). 			
Monitoring method and frequency			
<p>The ECO must investigate records of waste removal, and complaints register. Penalties shall be recommended where driving has occurred off road.</p>			<p>ECO- as per schedule</p>

A Fire Management Plan should be submitted to the ECO for approval.			ECO- as per schedule
Roads and traffic management			
<ul style="list-style-type: none"> • Footprint of new roads must be minimised as far as possible. Existing roads must be used where feasible to avoid further transformation of land and habitat destruction. • Under no circumstances may vehicles traverse the site off roadways. • All construction vehicles should adhere to a low speed limit on site (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. • Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. 	Contractor	Construction phase	ECO- as per schedule
Earthworks and blasting			
<ul style="list-style-type: none"> • Prevent excessive noise generation during the day and night and record all noise complaints received from nearby receptors. • Blasting should be minimised and used only when necessary to avoid disturbance to bats. • Limit earthworks in sandy areas during windy conditions as far as possible (i.e. winds above 40km/h) 	Contractor	Construction phase	ECO- as per schedule
Pollution and fires			
<ul style="list-style-type: none"> • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels into the natural environment. • No washing of equipment and plant may take place on bare soil. A wash bay should be constructed with an impermeable floor and a sump to separate 	Contractor	Construction phase	ECO- as per schedule

<p>hydrocarbons from water. No grey water may be released from the sump into the environment.</p> <ul style="list-style-type: none"> • Where unavoidable, emergency situations may require in situ maintenance of equipment or vehicles. This should occur in transformed footprints, away from drainage lines and a drip tray or other contained, impermeable surface must be used. • All works relating to the use of hazardous substances must be undertaken over a drip tray. • Refuelling shall only occur within the designated construction camp. • Cement powder has a high pH. Spillage of cement powder and concrete slurry can therefore affect both soil and water pH significantly. The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. No batching shall occur directly on unprotected ground. • Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. • All wastewater resulting from batching of concrete shall be taken back to the construction camp and disposed of appropriately. • Empty cement bags, and other litter, shall not be permitted to be blown around the site. • Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes on site and allow grey water to flow on bare soil. Any spillage resulting from “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system. Readymix trucks shall not be permitted to dump drum wash on site, unless into a contaminated water pond within the construction camp, which must be fully rehabilitated at completion and the sediment collected for disposal. • Windblown litter, construction debris and spoil shall be collected daily and removed for disposal via the construction camp. • No uncontained (open) fires should be allowed within the site as there is a risk of runaway veld fires. 			
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<ul style="list-style-type: none"> • Contractor to ensure that construction related activities that pose a potential fire risk, such as welding or other “hot works”, 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 “hot works” in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. • Contractor should provide adequate fire fighting equipment on-site. • Contractor should provide fire-fighting training to selected construction staff. • 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 should compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities 			
Monitoring method and frequency			
The ECO shall monitor compliance with the abovementioned mitigation measures.			ECO- as per schedule
During these inspections, the ECO shall conduct a visual inspection of each of the environmental aspects highlighted in this report. Any faunal fatalities or incidents must be recorded.			
A Traffic and Transportation Management Plan should be submitted to the ECO for approval.			
A Stormwater Management Plan should be submitted to the ECO for approval.			
Temporary infrastructure and roads			
<ul style="list-style-type: none"> • Upon completion of construction activities, all areas that are no longer required during the operational phase must be cleared and rehabilitated. • The area must be cleared of all excess construction materials. All contaminated soil and waste should be disposed of at a registered hazardous waste site. Proof of such disposal must be kept on file by the Project Manager. The site must be cleared of litter and all general waste should be disposed of at a registered municipal landfill site. • The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction, where practically possible. 	Contractor	Construction phase completion	ECO- as per schedule

<ul style="list-style-type: none"> • Compacted areas, such as roads, stockpile areas and construction platforms shall be ripped or scarified to a depth of ~300mm. 			
Spoil management			
<ul style="list-style-type: none"> • Any subsurface spoils from excavation must be disposed of where they will not bury the topsoil of agricultural land. • Any additional overburden must be respread below the topsoil layer, and not mixed with it. 	Contractor	Construction phase completion	ECO- as per schedule
Topsoil management			
<ul style="list-style-type: none"> • The topsoil that was stockpiled during the construction phase is to be used as topsoil cover during the rehabilitation process. • If there is not enough topsoil for rehabilitation purposes, topsoil should be purchased and spread across all disturbed areas. 	Contractor	Construction phase completion	ECO- as per schedule

Revegetation			
<ul style="list-style-type: none"> • Where there is likely to be a delay of greater than two weeks in the landscaping and revegetation of a disturbed area, or where the site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated or suitably stabilised in some other manner (e.g. straw worked into upper layer of soil) to combat dust generation and prevent erosion. • This revegetation shall preferably occur incrementally immediately upon completion of the construction activities at the subject location. Should the revegetation of certain areas be done at a later stage due to finalisation of landscaping design and considerations, care should be taken to prevent soil erosion and windblown dust from exposed areas. • The Contractor may not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process, unless approved by the ECO. • After seeding of the rehabilitated areas, if necessary the area should be irrigated to promote germination and vegetation establishment. If possible, this process should occur within the wet season to make use of natural rainfall. • All rehabilitated areas shall be considered no-go areas and the Contractor shall ensure that none of his staff or equipment enters these areas. 	Contractor	Construction phase completion	
Erosion and sedimentation			
<ul style="list-style-type: none"> • Erosion channels formed during the construction phase must be backfilled and consolidated and the areas must be restored to a proper stable condition. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. • Brush packing can be used in erosion channels or at drainage outlets. Alien vegetation may not be used for the purposes of brush packing. • Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. 	Contractor	Construction phase completion	

<ul style="list-style-type: none"> No stormwater runoff must be allowed to discharge directly into any watercourse along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation. Stormwater from hard stand areas, buildings and substations must be managed using appropriate channels and swales when located within steep areas or have steep embankments. The Contractor shall undertake reasonable measures to prevent soil erosion of the rehabilitated areas. 			
Alien plant management			
<ul style="list-style-type: none"> All alien plant re-growth, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as <i>Prosopis</i> are already present in the area and are likely to increase rapidly if not controlled. 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. 	Contractor	Construction phase completion	
Monitoring method and frequency			
Revegetation shall be considered successful once 80% basal cover with indigenous species has been attained. Cover will be measured by the ECO by means of quadrants/ plot sampling at regular intervals at the Wind Farm construction site.			
Monitor culverts to see if erosion issues arise and if any erosion control is required.			
All alien plant re-growth on site, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated. The Contractor shall remain responsible for removal of alien invasive plants during the defects and liability period and shall submit an Alien Invasive Management Plan to the ECO and Project manager for approval prior to practical completion.			
All alien plant re-growth, which is currently limited within the greater region 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			

The ECO should audit the site at the end of the Contractor's retention period to establish whether rehabilitation has been successfully carried out. If not, the retention money should be used to implement additional rehabilitation measures.	
A Revegetation and Habitat Rehabilitation Plan should be submitted to the ECO for approval.	
An Open Space Management Plan should be submitted to the ECO for approval.	
An Erosion Management Plan should be submitted to the ECO for approval.	
<p>Establish an effective record keeping system for each area where soil is disturbed below surface for construction purposes. These records should be included in environmental performance reports, and should include all the records below:</p> <ul style="list-style-type: none"> • Record the GPS coordinates of each area (if these are not already accurately recorded on site layout diagrams). • Record the date of topsoil stripping and the location of where the topsoil is stockpiled. • Record the date of cessation of construction (or operational) activities at the particular site. • Photograph the area on cessation of construction activities. • Record date and depth of re-spreading of topsoil. <p>Photograph the area on completion of rehabilitation and on an annual basis for at least two to five years thereafter to show vegetation establishment and evaluate progress of restoration over time This record keeping system must be established by the Contractor and handed over to Operator at end of the construction phase.</p>	

5.3 Operational Phase

Mitigation measures (impact management actions)	Responsibility	Implementation Timeframe
Specialist Mitigation Measures		
TERRESTRIAL ECOLOGY		
Implement the alien management plan, during the construction phase. The management should then continue into all future phases of the project	ECO (during construction)/ Operator	Operation phase
BATS		

Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level.	Operator/Proponent Bat specialist	Operation phase
Apply additional curtailment, as recommended by a bat specialist, if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan <i>et al.</i> 2018)	Operator/ Proponent	Operation phase
Use as little lighting as possible, and only where essential for operation of the facility, to avoid attracting insects and hence bats.	Operator/ Engineer	Operation phase
Where lights need to be used such as at the substation and elsewhere, these should have low attractiveness for insects such as low-pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992) and should not be used as far as possible.	Operator/ Engineer	Operation phase
As far as possible, lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow.	Operator/ Engineer	Operation phase
Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.	Operator/ Engineer	Operation phase
AVIFAUNA		
A 200m no-go buffer zone (all infrastructure) is proposed around water points as they serve as focal points for bird activity. There is one exception to this condition namely a new site road that will be constructed and utilized parallel to the public road on the other side of the road from the water point, on Portion 1 of Farm 214.	Operator	Operation phase
For those turbines placed in highly suitable Red Lark habitat, as determined by the avifaunal specialist, turbine cut in-speeds should be increased to 3m/s (measured at ground level) during daylight hours when a rainfall event of 10mm or higher is recorded at the site.. The increased cut-in speeds to be maintained for a period of six weeks after the rainfall event.	Proponent	Operation phase
Monitoring of avifaunal fatalities should occur according to the applicable best-practise guidelines in effect at the commencement of the operational phase. Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be biologically	Proponent/ Operator	Operation phase

significant as determined by the avifaunal specialist, including selective curtailment of problem turbines during high risk periods, or the painting of one blade with a contrasting colour, provided that the latter is technically feasible i.e. in accordance with an industry standard, and can be achieved within the framework of civil aviation regulations.		
If turbines are to be lit at night, lighting should be kept to a minimum and should preferably not be white light. Pilot activated lighting or Flashing strobe-like lights should be used where possible (provided this complies with Civil Aviation Authority regulations and will not introduce nuisance impacts).	Engineer	Operation phase
Lighting of the wind farm (for example security lights) should be kept to a minimum. Lights should be directed downwards (provided this complies with Civil Aviation Authority regulations).	Engineer	Operation phase
SOCIO-ECONOMIC		
Where possible and feasible, implement a training and skills development programme for locals during the first 5 years of the operational phase (unless sufficient suitably trained individuals are already available in the local area). The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.	Proponent/ Operator	Operation phase
The relevant lease agreements between the proponent and landowners must be put in place and signed off prior to commencement.	Proponent	Operation phase
The proponent, in consultation with the HLM, should investigate the option of establishing a Community Development Trust or similar vehicle to invest in local socio-economic development and enterprise development initiatives. The Hantam LM should be consulted as to the structure and identification of potential beneficiaries of the Trust. The key departments in the Hantam LM that should be consulted include the Municipal Managers Office, IDP Manager, and the LED Manager.	Proponent	Operation phase
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.	Proponent	Operation phase
Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.	Proponent	Operation phase
The proponent should establish 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	Proponent	Operation phase

the facility or funded via other feasible and reliable mechanisms. 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.		
VISUAL		
Dust suppression measures to reduce dust generated by moving vehicle.	Operator	Operation phase
Routing maintenance for soil erosion and strict litter control.	Operator	Operation phase
Light spillage reduction management should be implemented	Operator	Operation phase
TRANSPORT		
Site accesses to be sufficiently large to safely accommodate turning radius of abnormal vehicles	Operator	Operation phase
Adequate warning signage of abnormal vehicles in advance of site access point	Operator	Operation phase
AGRICULTURE		
Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.	Operator	Bi-annually
Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring	Operator	Bi-annually
Facilitate re-vegetation of denuded areas throughout the site	Operator	Bi-annually
Undertake a periodic site inspection to record the progress of all areas that require re-vegetation.	Operator	Bi-annually
General		
Artificial lighting		
<ul style="list-style-type: none"> If any part of 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. 	Proponent / Operator	Operational phase

<ul style="list-style-type: none"> • No high exposure farm dwellings were identified, however, should local farm residential dwellings located within a three kilometre distance from the proposed project complain regarding the flashing of the lights at night, small to medium sized trees should be planted at the farm dwelling so as to screen off the night-time flashing of lights from the rural receptors. The recommended trees species is <i>Acacia karroo</i>, or similar that will grow to a medium height in this semi-arid environment. The tree plantings should be supervised by the WEFs environmental officer, or other suitably qualified person. Once planted, the maintenance of the trees is the responsibility of the farm owners / resident. Guidelines for planting trees are: <ul style="list-style-type: none"> ○ Planting holes shall be appropriate for the size of tree being planted (e.g. 1m x 1m for a tree in a 10l plant bag). ○ The trees should be positioned such that its roots do not touch the bottom of the hole, and the upper level of the plant is just below the surface to allow for water catchment. ○ Lime, Bonemeal and a water retention polymer need to be added to each hole in the following quantities, or as recommended by the qualified individual overseeing the planting. For 4-10l bag plants: <ul style="list-style-type: none"> ▪ 175g Bonemeal; ▪ 250g Lime; and ▪ Polymer as per manufacturer specifications. ○ At the time of planting, the holes should not be filled with water. • Where possible utilise lights with wavelengths that attract less insects (low thermal/infrared signature). If not required for safety or security purposes, lights should be switched off when not in use or equipped with passive motion sensors. 		
Fauna		
<ul style="list-style-type: none"> • Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required. • 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 	Proponent/ Operator	Operational phase

are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.		
Soil Erosion		
<ul style="list-style-type: none"> Erosion management at the site should take place according to the Erosion Management and Rehabilitation Plan. No wind and water erosion on and downstream of the site as a result of run-off from the site. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 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. 	Proponent/ Operator	Operational phase
Alien Plant Vegetation		
<ul style="list-style-type: none"> An alien invasive management plan must be compiled for the operational phase (see 5.3.1) Wherever excavation is necessary, topsoil should be set aside and replaced after maintenance to encourage natural regeneration of the local indigenous species. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as <i>Prosopis</i> are already present in the area and are likely to increase rapidly if not controlled. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted using the best-practice methods for the species concerned, in accordance with the alien invasive management plan. The use of herbicides should be avoided as far as possible 	Proponent / Operator / EO	Operational phase

5.4 Decommissioning Phase

Mitigation measures (impact management actions)	Responsibility	Implementation Timeframe	Monitoring
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Specialist Mitigation measures			
TERRESTRIAL ECOLOGY			
Implement the Plant and Animal Search and Rescue Plan prior to any decommissioning activities with the requisite permits in place as supplied by the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.	ECO/Contractor	Decommissioning Phase	ECO- as per schedule
Implement the alien management plan, during the construction phase. The management should then continue into all future phases of the project	ECO/Contractor	Decommissioning Phase	ECO- as per schedule
BATS			
Decommissioning must be done in such a way as to avoid the destruction of potential and actual roosts, particularly trees, rocky crevices (if blasting is required) and buildings.	Proponent	Decommissioning Phase	ECO- as per schedule
It is recommended that decommissioning activities are limited as much as possible in areas identified as medium sensitivity of the bat sensitivity map. Blasting/removal of trees/removal of pre-existing buildings is prohibited within high bat sensitivity areas.	Engineer	Decommissioning Phase	ECO- as per schedule
Before destruction of features with possible roosts, the ECO needs to investigate the area so as to establish whether there is a bat roost. The ECO must be in contact with the bat specialist so as to be instructed what to look for. If a roost is found, a bat specialist must be contacted before further disturbance of the roost.	ECO	Decommissioning Phase	ECO- as per schedule
AVIFAUNA			
Restrict the decommissioning activities to the decommissioning footprint area Do not allow any access to the remainder of the property during the decommissioning period	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
AQUATIC			
Any dust suppression must be kept to a minimum, to prevent the formation of pools, or runoff that may then contain pollutants.	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
All liquid chemicals including fuels and oil, including the BESS must be stored in secondary containment (bunds or containers or berms) that can contain a leak or spill.	Contractor/ Proponent	Decommissioning Phase	ECO- as per schedule

Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.			
Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).	Everyone	Decommissioning Phase	ECO- as per schedule
Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.	Contractor/	Decommissioning Phase	ECO- as per schedule
All construction camps lay down areas, wash bays, batching plants or areas and any stores should be more than 50 m from any demarcated water courses.	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
Littering and contamination associated with construction activity must be avoided through effective construction camp management.	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
No stockpiling should take place within or near a water course	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
SOCIO-ECONOMIC			
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the decommissioning phase proven to be associated with the decommissioning activities for the WEF will be compensated for, if evidence can be provided. The contractor may be liable for such compensation costs, as per the contract between the proponent and the contractor/s.. In addition, the landowners should be encouraged to join the local Fire Protection Association;	Proponent/ Contractor	Decommissioning Phase	-
Contractor/s should ensure that no open fires are allowed on the site; Contractor to ensure that decommissioning 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;	Contractor	Decommissioning Phase	-

Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard, special care should be taken during the high risk dry, windy summer months;	Contractor	Decommissioning Phase	-
Contractor should provide adequate fire-fighting equipment on-site;	Contractor	Decommissioning Phase	ECO- as per schedule
Contractor should provide fire-fighting training to selected construction staff;	Contractor	Decommissioning Phase	ECO- as per schedule
As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or decommissioning activities, the appointed contractors should compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.	Contractor	Decommissioning Phase	-
As far as possible, the transport of components to the site along the N7 should be planned to avoid weekends, holiday periods and the Spring Flower (typically August-September) season if possible.	Contractor/Engineer	Decommissioning Phase	-
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
The contractor must ensure that damage caused by decommissioning related traffic to the Nuwepos/ Granaatboskolk Road and local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;	Contractor	Decommissioning Phase	-
All vehicles must be road-worthy and drivers must be licensed and made aware of the potential road safety issues and need for strict speed limits;	Contractor	Decommissioning Phase	-
The Contractor should liaise with the affected farmers regarding timing and location of construction activities so they can make alternative arrangements for their sheep;	Contractor	Decommissioning Phase	-
The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;	Contractor	Decommissioning Phase	-

The Contractor should be required to collect waste along the access road on a weekly basis;	Contractor	Decommissioning Phase	-
Waste generated during the decommissioning phase should be transported to the local landfill site or other appropriate recycling/disposal facility.	Contractor	Decommissioning Phase	-
The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned.	Proponent	Decommissioning Phase	-
All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning.	Proponent	Decommissioning Phase	
The proponent should establish 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 or funded via other feasible and reliable mechanisms. 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.	Proponent	Decommissioning Phase	-
VISUAL			
Dust suppression measures to reduce dust generated by moving vehicles and earth cleared of vegetation. Signage on the Nuwepos Road should be moderated (approximately 1m high x 1.5m wide) and natural colours used in the signage as much as possible.	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Fencing should be simple and appear transparent from a distance. The fences should be checked monthly for the collection of litter caught on the fence.	Contractor/ECO	Decommissioning Phase	ECO- as per schedule
Soil erosion measures need to be adequately implemented and routinely monitored by the ECO. Dust suppression to reduce dust from moving vehicles when required (Decommissioning phase).	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule

Removal of all wind turbine infrastructure, structures, cabling. Impacted areas need to be rehabilitated and restored to natural veld grasses (Decommissioning phase).	Contractor/ ECO	Decommissioning Phase	ECO- as per schedule
TRANSPORT			
A Pre and Post road condition assessment of the Granaatboskolk Road used to site	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Road maintenance & monitoring plan for the decommissioning phase, for public roads (like Granaatboskolk Road) as well as internal site roads	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Clear information published to public regarding dates, times and routes of abnormal vehicle transportation through various towns	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Clear information published to public regarding risks associated with driving near or behind abnormal roads	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Site accesses to be sufficiently large to safely accommodate turning radius of abnormal vehicles	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
Adequate warning signage of construction and abnormal vehicles in advance of site access point	Contractor/Engineer	Decommissioning Phase	ECO- as per schedule
AGRICULTURE			
Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.	Contractor/ECO	Every 2 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved.	ECO- as per schedule
Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Contractor/ECO		ECO- as per schedule
Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion	Contractor/ECO	Every 4 months during the decommissioning	ECO- as per schedule

Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation.	Contractor/ECO	phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved.	ECO- as per schedule
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.	Contractor/ECO	As required, whenever areas are disturbed.	ECO- as per schedule
Record GPS positions of all occurrences of below-surface soil disturbance (e.g. excavations). Record the date of topsoil stripping and replacement. Check that topsoil covers the entire disturbed area.	Contractor/ECO	As required, whenever areas are disturbed.	ECO- as per schedule

6 Plans, Permits and Programmes

Several plans, permits and programmes may be required through the duration of the project lifecycle. The requirements for these will be determined throughout the environmental impact assessment process through consultation with the authorities and may require amendments as the project proceeds. These have been briefly described below as follows.

- Permits:
 - Water use license/registration
- Plans:
 - Alien Invasive Management Plan;
 - Rehabilitation and revegetation Plan;
 - Plant Rescue and Protection Plan
 - Animal Rescue and Protection Plan
 - Open Space Management Plan
 - Traffic and Transportation Management Plan
 - Stormwater Management Plan
 - Fire Management Plan
 - Erosion Management Plan
 - Emergency Response Plan.

The plans are further discussed in in section 6.2 below.

- Programmes
 - Environmental Awareness Programme.

6.1 Permits

6.1.1 Water Use Authorisation

Section 21 of the National Water Act (Act 36 of 1998) recognises water uses that require authorisation by DHSWS before they commence. Construction of infrastructure within 32m of a drainage line will likely be required for the associated roads and Water Use License Application (WULA) is therefore required in terms of Section 21 (c) and (i). Alternately, water use may also be generally authorised in terms of Section 39 of the Act if that the water use complies with conditions set out in the specific General Authorisation which has been published in a Government Gazette. The General Authorisation for water uses as defined in Section 21(c) or (i) issued under GN 509 of 26 August 2016 defines the “regulated area of a watercourse” as:

- The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse; or
- A 500 m radius from the delineated boundary (extent) of any wetland or pan.

This requires that all activities undertaken within these regulated areas would have to be authorised in terms of this General Authorisation mentioned above.

Applications have been submitted, however it will only be processed if the project is awarded preferred bidder status in terms of the Renewable Energy Independent Power Producer Procurement (REIPPPP). No water use may begin without the appropriate authorisation.

6.1.2 Permit for protected species

It is important that any removal of indigenous vegetation and trees be managed according to the National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA) to ensure that the proper procedures are followed when removing or damaging vegetation which could potentially be protected species. In addition, Northern Cape Nature Conservation Act No 9 of 2009, amended 2012 (NCNCA). Any plants or animals listed and found within the site will require respective permits for removal/relocation prior to construction.

6.2 Management Plans

6.2.1 Alien Invasive Management Plan

6.2.1.1 Purpose

The purpose of the Kokerboom 3 Wind Farm Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the operation of the construction and operation of the wind energy facility. The broad objectives of the plan include the following:

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

6.2.1.2 Problem background and legislative context

Alien plants require management because they replace indigenous vegetation leading to 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 recognition of these impacts, South Africa has legislation in place which requires landowners to clear or prevent the spread of certain declared weeds from their properties.

NEMBA provides the invasive status classification, as outlined in the Alien and Invasive Regulations and Species list (2014), for all identified alien invasive plant species. These plants can be classified as Category 1a, 1b, 2 or 3 species. The description of the abovementioned classifications are:

Category 1a plants

Category 1a Listed Invasive Species are those species listed in terms of section 70(1)(a) of NEMBA as species which must be combatted or eradicated.

A person in control of a Category 1a Listed Invasive Species must-

- comply with the provisions of section 73(2) of NEMBA;
- immediately take steps to combat or eradicate listed invasive species in compliance with

- sections 75(1), (2) and (3) of NEMBA; and
- allow an authorised official from the Department to enter onto land to monitor,

Category 1b plants

Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEMBA as species which must be controlled.

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.

- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- A person must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

Category 2 plants

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of NEMBA as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.

- Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
- A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area, must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3 of NEMBA.
- Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

Category 3 plants

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

- Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3 of NEMBA.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of NEMBA, a person must control the listed invasive species in accordance with such programme.

6.2.1.3 Ecological context

Alien species are adept at taking advantage of disturbance and many of their traits are linked to this ability. This usually includes the ability to produce large amounts of seed or being flexible in terms of their size, growth form or reproductive strategy. Alien plant control strategies therefore need to focus on these key attributes while management practices need to ensure that they do not create circumstances under which alien species are encouraged or can thrive. Perhaps the most important aspects in this regard are minimizing disturbance and ensuring the retention and recovery of indigenous vegetation as far as possible.

While the site is currently largely free of alien species it is not possible or practical to prevent alien species from entering the site as seed or spreading into disturbed areas from existing localized infestations. As such, some alien infestation is almost certain to occur, at least in some places and by some species. The disturbance created during construction will render the site vulnerable to invasion for some time thereafter and it is likely that many alien species from the local species pool will invade the site during or immediately after construction.

In the short-term, soil disturbance is likely to be the dominant driver of alien invasion at the site. While, in the long-term the distribution of runoff is likely to be a key driver as those areas which receive water will be wetter and likely to contain a higher alien abundance. As disturbance is the major initial driver of alien species invasion, keeping the disturbance footprint to a minimum is a key element in reducing alien invasion risk and severity. Wherever possible, the indigenous vegetation should be left intact as this will significantly reduce the likelihood of alien invasion as well as other degradation problems such as erosion.

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 some parts 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, areas of cut and fill along roads, crane pads and construction footprints etc.
- Construction camps and lay-down areas which are cleared or are active for an extended period
- Areas which receive runoff from roads, crane pads and other hardened areas.

General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of cleared areas. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they do currently.

- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

Clearing Methods

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

Use of Herbicides for Alien Control

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

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

6.2.1.4 Alien management actions and activities

In order to maintain the site free of alien weeds and trees, the following plan should be implemented during construction and operation.

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 Actions/Activities	Frequency
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The ECO is to provide permission prior to any vegetation being cleared for development.	Ad Hoc
Clearing of vegetation should be undertaken in stages or sections as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it, or stabilised via other suitable means.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Monthly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas. The work area should be clearly marked with construction or similar tape to demarcate the area to which vegetation disturbance and construction activity is to be confined.	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 should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period. The alien plant removal and control methods used should adhere to best-practice for the species involved. Such information can be obtained from the Working for Water website.	Monthly
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas. Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape and signage indicating their no-go status posted. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

Monitoring Actions - Construction Phase

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

Monitoring Action	Indicator	Frequency/Period
Document alien species present at the site	List of alien plant species	Pre-construction
Document alien plant distribution	Alien plant distribution map	Bi-annually
Document & record alien control measures implemented	Record of clearing activities	Bi-annually
Review & evaluation of control success rate	Decline in documented alien abundance over time	Bi-annually

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

Monitoring Actions - Operational Phase

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

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

6.2.1.5 Recommended Alien Plant Clearing and Control Protocols

- a) The appropriate alien management strategy pertinent to the situation/environment should be identified and implemented.
- b) The Alien Plant Management Plan for alien vegetation includes three phases:
 - I. **Initial control:** drastic reduction of the existing population;
 - II. **Follow-up control:** reduction of seedlings, root suckers and coppice growth;
 - III. **Maintenance control:** sustain low alien plant numbers/density with low annual costs. At this phase, alien plants must no longer be considered a problem. Monitor the situation two-three times each year (spring, mid-summer and autumn) to avoid alien plant re-infestation, spread and densification, and thereby avoid increased control costs.

Initial Control

Fell trees - control stumps - plant grass

- a) Fell trees, treat stumps, remove wood and if necessary, rehabilitate. This strategy is suitable where infestations are easily accessible and can be harvested (i.e. for firewood, charcoal, building materials, mulch production). It is also suitable for trees that need removal for utility or aesthetic purposes or where they pose a potential hazard to waterways, building structures, etc.
- b) **Control Method for trees:** Use chainsaws, bow-saws, brush cutters or cane knives to fell trees and saplings. Stump height should be less than 15 cm. Apply a registered herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure that stumps are not missed.
 - I. **Cut stump treatment:** Apply the recommended herbicide mixed in water to the

cut surface of stumps. Do NOT spray the sides of stumps. Apply herbicide mix up to one hour after felling or the cut wood will seal.

- II. **Total Stump treatment:** Apply the recommended herbicide mixed in diesel to the cut surface, down the sides of stumps and to any exposed roots. The herbicide mix can be applied even several days after felling. Ensure herbicide can be mixed with diesel.
 - III. **Stump treatment with herbicide plugs:** After felling, make holes in the stumps and insert plugs containing the herbicide, which is released into the stumps.
- c) Control method for seedlings, saplings and coppice: In a mixed age stand, where there are young plants and coppice growth, cut the plants with a brush cutter and treat the stumps. Hand pull seedlings. Do not spray foliage as many plants may be damaged during felling and may not absorb enough of the herbicide for effective control. Untreated plants can be controlled with foliar herbicide during follow-up work.
 - d) Disposal of brushwood: Where wild fires are a potential hazard, spread out the brushwood evenly over a large area. Avoid large heaps as this is a fire hazard and burning will cause breakdown of the soil structure. Trees that cannot be utilised should be controlled standing to avoid burning large amounts of wood lying on the soil surface.
 - e) Rehabilitation: Sow grass and/or shrubs in the bare soil around the stumps immediately after the first reliable rains. Spread brushwood over the buried seed to aid seedling establishment. Brushwood can be used as fences/barriers and pegged to stabilise slopes where necessary.

Alien shrubs less than 1 m tall

- i. Foliar application of a registered herbicide is required.
- ii. When dense seedling growth of uniform height is present use knapsack sprayers with flat fan nozzles.
- iii. Use solid cone nozzles for seedlings of uneven height, coppice growth, root suckers and short saplings.
- iv. Rehabilitate cleared areas with locally-occurring species if necessary

Alien shrubs taller than 1 m

- v. **Mechanical Control pre-treatment:** Where shrubs are taller than 1.5 m, the height must be reduced by cutting, using sharpened hoes, cane knives or motorised brush cutters. For large areas of dense growth, use a tractor-mounted gyro-mower (set as low as possible) after slashing or cutting plants, either treat the freshly cut stumps or allow re-growth to knee height and then spray with a suitable registered herbicide.
- I. **Cutting for stump treatment:** This is suitable for low - medium density infestations but is usually not practical for high density infestations. Slash plants below 15 cm in height for stump application. Control the stumps immediately after cutting the plants. Stump application is best during the active growing season.
 - II. **Cutting from coppice treatment:** This is suitable for medium - high density infestations. Slash plants at a convenient height (e.g. knee height for foliar application

to coppice re-growth. Cutting dense plants is good winter work but itiring so must be well organised. Spray coppice re-growth during the active growing season, when there is enough leaf cover to absorb the herbicide.

- III. **Flattening:** Roll empty 200L metal drums or place large pieces of corrugated iron to make paths through dense thickets of plants (e.g. Bramble). This increases access for foliar or stump application.
 - IV. **Cut pathways:** This increases access for control work.
 - V. **Mechanical uprooting:** Uprooting of shrubs with mattocks results in soil disturbance, especially where large plants are present in dense thickets. Use only where not susceptible to erosion or where soil can be stabilised effectively.
- b) **Disposal of small amounts of cut material:** Small amounts of cut top growth material do not impede access for follow-up control work. Leave the material to act as a mulch and to decompose, or spread over planted grass seed to aid seedling establishment. This adds organic material to the soil.
 - c) **Disposal of large amounts of cut material:** Cut the plants and use long poles/branches to roll the material away from stumps. Where cut material hampers access for follow-up control, roll into heaps and burn. Alternatively, spread large amounts of cut material over a large area for a cool burn. This avoids hot intense fire that would destroy the soil surface. Burn during the wet season for a cooler burn.

Rehabilitation: Avoid sowing on compacted soil or soil with a 'crust' as the seed will be washed away after the first rains. In such cases light soil disturbance is necessary e.g. using rakes for broadcast sowing or sharp-pointed hoes for row sowing. Sow suitable grass species on bare soil. Cover the buried seed with small amounts of cut top growth material to aid grass establishment. The material retains moisture in the soil, traps soil after heavy rains, and by rotting contributes organic material to the soil to aid seedling establishment.

6.2.1.6 Chemical control of alien herbs

- a) There are many herbaceous alien (soft/non-woody) species present and likely to occur sporadically throughout the operational phase of the development.
- b) Alien herbs are called *broadleaf weeds* and some have pre- and post-emergent herbicides registered for their control.
- c) However, where alien herbs are associated with woody alien plants, herbicides registered for control of woody aliens are often also used for control of broadleaf weeds.
- d) Alternatively, glyphosate is used, as this is often registered for both woody and non-woody species. Glyphosate is a post-emergent (foliar applied) herbicide that is inactivated by soil.

Rehabilitation: Alien herbs usually occur in disturbed areas, where rehabilitation is not generally a high priority. However, in some situations, rehabilitation with grass or shrubs is required for control of alien herbs. However, only indigenous grasses and/or shrubs growing in the study area should be used for such rehabilitation.

Perennial grasses are often planted after a disturbance to stabilise the soil and suppress alien herbs. Alternatively creeping species (such as *Cynodon dactylon*) that have good soil binding ability to prevent erosion. Planting a quick-growing grass on bare soil results in a dense rapid cover that successfully competes with establishing alien herbs.

Follow-up control

Follow up control of alien seedlings, saplings and coppice re-growth is essential to achieve and sustain the progress made with initial control work. If this phase is neglected, the cleared area will soon become infested with dense alien vegetation again, arising either from re-invasion by the original species or from invasion/encroachment by another species.

Follow-up control is essential to prevent alien seedlings suppressing planted or colonizing grasses. Before starting initial control operations in new infestations, all required follow-up control and rehabilitation work must be completed or in progress in areas initially prioritised for clearing and rehabilitation.

Follow-up control should combine the following methods:

- a) Chemical control methods (always use registered herbicides);
- b) Mechanical control methods, and
- c) Available biological control agents

Evaluate and select methods for follow-up control work according to species, and the type and density of re-growth.

6.2.1.7 Control methods for dense re-growth

Dense re-growth may arise after initial control operations, as seedlings, root suckers or stump coppices. For example, wattle seedlings are stimulated to germinate after fire or seedlings may arise from a high seed bank in the soil.

- a) Do not uproot or hoe out dense seedlings. This would result in soil disturbance that promotes germination and flushes of alien seed growth.
- b) Do not cut plants to control stumps where stump density is high. Stump application would be impractical with many untreated stumps.
- c) Instead cut tall dense re-growth with brush cutters or bush knives. Remove top growth to allow access for foliar spray of coppice re-growth.

6.2.1.8 Control method for low-medium density re-growth

Areas with low-medium density re-growth are considered high priority for control as neglect of these areas will result in densification and spread that is more costly to control. Large areas of low-density growth can be controlled rapidly

- a) **Cut plants and control the stumps:** Stump height should be less than 15 cm. Use a recommended registered herbicide. Apply the herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure no stumps are missed. For cut stump treatment, apply the herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of the stumps. Apply the herbicide within 1 hour of cutting the plants before the wound seals. For total stump treatment, apply a herbicide mixed

with diesel to the cut surface, down the sides of stumps and to exposed roots. The herbicide mix can be applied up to several days after cutting the plants

- b) Foliar **spray on coppice re-growth and saplings**: Re-growth can be sprayed up to a height of 1 m. Apply the herbicide in knapsack sprayers using solid cone nozzles with a suitable dye to avoid over- or under-spraying.
- c) Mechanical control options: Hand pull seedlings when the soil is wet, using gloves to protect the hands.

Maintenance control

Aim to keep the area stabilised by maintaining a good grass or shrub cover. Prevent further soil disturbance. Annual inspection of vegetation cover and alien plant re-growth is essential. Follow-up and maintenance control work each year will protect the planted plant cover. If this is neglected, the rehabilitated area will revert to dense patches of alien plants, resulting in increased control costs and loss of indigenous cover.

Integrated Control

Areas should be ranked into high, medium and low priority work areas, where high priority areas would be controlled first.

1. High Priority Areas for control

a) Low density infestations

- i. Start maintenance control in areas with low alien plant numbers, targeting especially mature seed-producing trees (identifiable by the presence of flowers during the flowering season and/or presence of seed), or parent trees that are a source of seed to the site. This may include trees outside of the site, within a minimum of 100 m from the site boundary.
- ii. Maintenance control is rapid and cost effective.
- iii. This will protect the natural vegetation that is already there, prevent formation of thickets, and halt encroachment (spread) of alien plants into surrounding areas.

b) Areas near top of slopes, water courses, steep bare slopes or long bare slopes

- i. Start control at the top end of water courses or at the top of slopes.
- ii. This prevents seed spreading downstream or downhill to infest new areas.
- iii. Plant grasses and/or shrubs on bare soil, especially on steep slopes or long bare slopes, to prevent erosion.

c) Areas where initial control work is completed and re-growth is present

- iv. Complete major follow-up control and rehabilitation work in all areas before starting initial control in new infestations.
- v. Control of seedlings protects newly planted vegetation.
- vi. Failure to control re-growth results in densification and spread of infestations, with increased control and loss of vegetation cover.
- vii. Continued maintenance is a long-term on-going exercise to prevent re-infestation.

d) Newly disturbed areas

- i. Areas where mechanical disturbance (such as removal of alien plants) or loss of vegetation cover has occurred provides an ideal seed bed for pioneer alien plant seedling establishment.
- ii. This re-growth should be controlled while still less than 0.5 m tall.
- iii. If this is neglected, re-growth will become taller and more dense, resulting in more costly control work and loss of vegetation cover.

e) Edges of dense spreading infestations

- i. Confine infestations when there are insufficient funds to control the whole infestation and where the alien plants are likely to spread and invade neighbouring areas.
- ii. To prevent spread, control trees, saplings, seedlings, coppice re-growth or shrubs in a 5 - 10 m wide strip around the edges of such infestations to confine them.
- iii. Move inwards from the edges with control work as funds become available.

f) Low density areas inside dense infestations

- i. Thin inside infestations to prevent densification (i.e. control all low-density areas inside the infestations to encourage grass growth. This will break up the large infestations into several smaller infestations that are more easily controlled.
- ii. Natural vegetation will gradually spread into the controlled areas as the alien plants die or are removed. The direction of grass spread therefore follows the control work, as the alien plants die. Sow seed in bare soil for a more rapid ground cover, especially on steep slopes or on easily eroded soil.
- iii. Monitor confined and thinned infestations 2 - 3 times each year. Repeat follow-up control operations as required, to ensure the controlled areas remain clear of re- growth and that the planted vegetation has established and remains healthy. Seedling re- growth will be evident in spring and early summer while re-growth and coppice will be easily observed in summer. When a re-infestation is observed it should be controlled immediately.

2. Low priority areas for control

- a) Stabilised areas where there is a healthy dense vegetation cover, and any alien plants are very sparse, difficult to detect and with little or no impact at present. Monitor alien plant growth and grass cover 2-3 times a year to ensure timely maintenance work.
 - b) Areas where dense infestation could become worse. Confine these dense infestations to prevent spread into new areas.
 - c) Areas where alien plants have little or no impact.
- Thus, **high priority** areas are identified where resources should be concentrated to achieve the desired aims. Control in these areas gives the greatest total benefit, and allows the best use of the limited available resources.

The **low priority** areas would consume resources with little benefit, and should therefore be ignored or re-evaluated each year for attention at a later date.

6.2.2 Rehabilitation and revegetation plan

6.2.2.1 Purpose

The revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed facility are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores ecological function to these areas as far as possible. The intention of the plan is not to provide a fully operational plan with detailed method statements and approaches, but rather to outline the principles that should underpin the operational implementation plan with rehabilitation actions that the appointed contractor would apply at the site during and immediately after construction.

6.2.2.2 Rehabilitation goals

It is important to define a rehabilitation benchmark and end-goal against which relative rehabilitation success at a site can be measured. The Society for Ecological Restoration (2002) provides eight objectives for a restored ecosystem:

- It should contain characteristic species that occur in the reference system;
- It should comprise largely of indigenous species;
- The functional groups necessary for continued stability must be present or have the potential to colonise;
- The physical environment must be conducive for the establishment of species that will lead to stability;
- It functions normally for its stage of development;
- It is integrated into a larger ecological matrix;
- Potential threats to the system's stability are eliminated;
- It is self-sustaining to the same degree as the reference system.

The above goals are fairly broad and the discussion that follows will provide details on how these goals can be achieved and what indicators can be used to measure progress towards these goals

6.2.2.3 Rehabilitation Targets

Although the overall goal of rehabilitation is provided above, it is common practice to set measurable targets against which progress can be measured and evaluated. Parameters that are usually measured include indicators of plant community structure and composition such as similarity to a reference area, species richness, species diversity, vegetation cover, species dominance, vertical structure and functional diversity of the vegetation. Important considerations with regards to setting such targets include ensuring that they are achievable, and secondly, that they change appropriately over time. In other words, there should be different targets for a parameter based on the time since rehabilitation. Targets for vegetation cover should be set as follows in reference to the baseline cover of the undisturbed vegetation:

- Year 1: 20%
- Year 2: 40%
- Year 3: 60%

Assuming that the background vegetation cover is 40% as typically occurs in the study area, the actual plant cover that would represent the above targets are as follows:

- 8% Cover
- 16% Cover
- 24% Cover

These targets must be closely tied into the monitoring schedule to provide references against which the effectiveness of monitoring can be measured. The ultimate goal should be to achieve approximately 80% of the background perennial plant cover.

Much has been made of species richness targets for rehabilitation. However, in most situations, these are not directly relevant as the emphasis should be on restoring ecological function. It is not practical or cost effective to attempt to restore high levels of plant biodiversity within a short time frame. Once some ecological function is restored, species richness will slowly increase and ultimately the effectiveness of rehabilitation in restoring species richness can only be evaluated after 10 or more years after rehabilitation. However, it is important to note that rehabilitation with a variety of species provides increased resilience to drought and other pressures. As a result, rehabilitation with single-species stands is not recommended and at least 3-4 species should be used in any area.

6.2.2.4 Plant Species suitable for Rehabilitation

No alien species should be used for rehabilitation within areas of natural vegetation. Although some of these are easy to establish, in the long-run, they retard the return of the indigenous species and do not contribute to meeting rehabilitation goals. Although the species selected for use in rehabilitation should come from the local indigenous species pool, not all species are equally suitable for use in rehabilitation. The primary criteria for selection are practical and economic which usually dictate the ease with which species can be established. This includes survival rates, with establishment success being measured in the field at least a year after planting, once plants can be considered established and self-sustaining. Although there are not large numbers of species which are suitable for rehabilitation, it is important to select a mix of functional types or growth forms (i.e. a mix of grasses, low shrubs and tall shrubs) as this adds structural diversity to the rehabilitated areas and also increases resilience. Within the context of the Kokerboom site, the selection of species is complicated by the variety of vegetation types present and the large differences in composition that occur between these types.

In terms of which species are considered suitable for use in rehabilitation and revegetation at the site, it is useful to consider what attributes such species should or should not have. For example, species which grow tall or which might quickly generate a high fire danger are considered unsuitable for use near infrastructure due to the risks and management problems they may cause. In addition, annual species which flourish only after rains are also considered unsuitable as these would be absent in dry periods, leaving the soil exposed and vulnerable to erosion. The following general criteria have been identified as being important or useful in the selection of species for use in revegetation and rehabilitation. Some of these are considered essential criteria and others are considered desirable.

Essential Criteria:

- **Only perennial species should be used.** Short-lived species may flourish after rains but die out shortly thereafter. In addition, such species may function to keep more desirable

perennial species out through depressing their growth and establishment.

- **Only naturally occurring species are considered.** Species which do not naturally occur in the area are not considered viable options for use at the site.
- **No toxic or weedy species to be used.** Any species which are considered toxic to animals or people are not suitable candidates for use.

Desirable Criteria:

- **Commercial availability of seed.** Ideally a species should have seed commercially available so that large quantities of seed can be purchased and used to establish the species across the site.
- **Ease of propagation.** For species that cannot be easily propagated from seed or for which seed is not commercially available, it is important that these species can be easily propagated vegetatively or by other means using standard nursery propagation techniques.
- **Ease of establishment.** Species used should be relatively easy to establish on-site, preferably using methods that be used across a broad area, such as standard agricultural planters or seed spreaders.
- **Ease of management.** Species used should be relatively easy to manage and should not pose a risk of become a problem at the site through establishing dense thickets, producing excessive biomass or otherwise hindering the daily operation of the plant.

6.2.2.5 Monitoring and Evaluation

The primary purpose of monitoring should be to inform and enable adaptive management interventions and improve rehabilitation outcomes. As such, monitoring must be linked to targets, their associated measurement intervals as well as what actions are triggered when a target has not been met. There should thus be a clearly defined feedback between monitoring outcomes and consequent rehabilitation actions. A critical component of monitoring is detailed record keeping and associated data management.

There are various approaches to monitoring and parameters that can be measured. It is however important that these are relevant and practical to measure. Simple indicators such as plant cover and species richness are usually the most simple and reliable to measure, with a variety of published and well-known sampling methods.

As rehabilitation success is unpredictable in arid environments, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following basic monitoring schedule with associated remedial actions is recommended:

- Re-vegetated areas should be monitored every 6 months for the first 18 months following construction. Thereafter, monitoring should be conducted annually until such time as the target areas have attained the desired benchmark vegetation cover.
- Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous shrubs or succulents present in the local area.

6.2.3 Plant Rescue and Protection

Purpose of the plant and rescue 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. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

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

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

6.2.3.1 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.

6.2.3.2 Successful plant rescue

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.

6.2.3.3 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 should commence during early spring after the first rains.

6.2.3.4 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 and/or appointed specialist 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 Rehabilitation and Revegetation Plan.

6.2.4 Animal Rescue and protection

To ensure the protection of animals on the site, as part of the induction training of all employees, the ECO will include animal awareness training that will address the types of animals known to the site or that can be anticipated at the site as well as the process of how to deal with different animal encounters. The ECO should ensure the following is adhered to:

- Any animal (mammal, reptile, amphibia, bird, insect or fish) found to be trapped within the site or in distress as a result of the site activities shall be appropriately relocated to a suitable site under the guidance of the ECO, relevant specialist if required or relevant authorities.
- Open trenches, excavations and earthworks pose a hazard to both domestic livestock and wild animals:
 - Trenches shall be regularly, inspected if they can be assessed by animals.
 - Domestic animals or livestock belonging to surrounding or landowners shall be kept away from the works, and in this regard appropriate stock-proof fencing may be required around excavations and earthworks
- Hunting or snaring any animal (mammal, reptile, amphibian, bird, insect or fish) is prohibited. Capturing any animal is prohibited, unless on instruction from the ECO where the animal is at risk from the development activities. No animal may be wilfully harmed unless it threatens the life of a person, or the person is in imminent danger.
- Potable water shall be provided for drinking purposes at the main Contractor's camp. Should a potable water supply / container be provided, then:
 - It is to be animal and weather proof and sealed / fenced to prevent potential contamination /drowning.

6.2.5 Open Space Management Plan

This EIA report provides the tool to contribute to safeguarding the natural assets and open spaces within the study area. Open spaces include recreation areas, nature conservation areas, areas of environmental significance and biodiversity, undeveloped areas which might be publicly or privately owned, urban agricultural land, natural areas like dense indigenous bush stands, natural veld and nature reserves, urban wilds, the rivers and wetlands, wildlife, geological features, soils and vegetation, etc. An open space management plan enables continuity in planning and management of open space as a collective resource. The following management actions take into account natural areas and open spaces, refers to the community perceptions and benefits, but also the threats and challenges facing open spaces within the study area.

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 following actions should 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 should be taken against littering.
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled
- All visitors and contractors should be required to sign-in
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited

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

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

6.2.6 Traffic and Transportation Management Plan

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

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

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

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

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

6.2.7 Stormwater Management Plan

A stormwater management plan must be developed during the pre-construction design phase by the civils contractor based on the detailed design of the site, and implemented during the construction phase of the project. The Proponent/ Operator should develop an appropriate stormwater management plan

for the operational phase of the project, based on the outcomes of the construction process. This plan shall comply with the Department of Water Affairs and Forestry's (DWAf) Best Practice Guideline (G1) for Stormwater Management (2006) and GN 704 (Government Gazette 20118 of June 1999). The plan should ensure compliance with applicable regulations and prevent off-site migration of contaminated stormwater 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 measures must promote the dissipation of stormwater run-off.

6.2.8 Fire Management Plan

This plan should be implemented during the construction and operation of the facility and should be guided by the following objectives:

- Preventing undesired wild fires;
- Implementing monitoring and reporting of fires on site;
- Providing all construction and operational staff with basic information about fire management for their safety and awareness; and
- Listing contact details and equipment relating to firefighting.

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

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

Contractors are to ensure that they have the necessary equipment readily avail

6.2.9 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.

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.

6.2.9.1 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 impacts

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.

6.2.9.2 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.

6.2.9.3 Erosion and Sediment Control Principles

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

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

6.2.9.4 On-site Management

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

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

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

6.2.9.5 Concentration of flows into downstream areas

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

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

6.2.9.6 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 should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of Flows

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

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

6.2.9.7 Monitoring requirements

Construction phase

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

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events.
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
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

Operation phase

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

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted	Map of erosion problem areas	Quarterly

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

6.2.10 Emergency Response Plan (ERP)

There are three levels of emergency as follows:

- Local emergency: An alert confined to a specific locality
- Site Emergency: An alert that cannot be localised and which present danger to other areas within the site boundary or outside the site boundary.
- Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there are any doubts as to whether any hazardous situation constitutes an emergency, then it must be treated as an evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas, then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur.

1. Emergency Scenario Contingency Planning

1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

Spill prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and EO. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or bunded designated areas.
- All maintenance materials, oils, grease, lubricants, etc should be stored in a designated area in an appropriate storage manner.
- No refuelling, storage, servicing or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
- No refuelling or servicing should be undertaken without absorbent material or drip pan properly placed to contain spilled fuels.
- Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.

- Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment
3. Stop the spill if safely possible.
4. Contain spill to limit entering surrounding areas.
5. Identify the substance spilled.
6. Quantify the spill (under or over guideline/threshold levels)
7. Notify the Site Manager and emergency response crew and authorities (in the event of major spill).
8. Inform users (and downstream users) of the potential risk.
9. Clean up the spill using spill kit or by Hazmat team.
10. Record the spill incident on company database.

a) Procedure for containing and controlling the spill (i.e on land or in water)

Measures can be taken to prepare for quick and effective containment and of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies located outside of the study area. The following methods could be used:

- Dykes- Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.
- Trenches- Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of the trench required. Spilled substances can be recovered using a pump or sorbent materials.

b) Procedure for transferring, storing and managing spill related wastes.

Used sorbent materials are to be placed in plastic bags or where unsuitable, other appropriate containers for future disposal. All materials mentioned in this section are to be available in or alongside the spill kits. Following clean up, any tools or equipment's used must be properly washed and decontaminated or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedure for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

1.2. Scenario: Fire (and fire water handling)

Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk.
2. Assess person safety, safety of others and environment.
3. If safe- attempt to extinguish, contain fire.
4. Notify the Site Manager and emergency response crew and authorities.
5. Inform users of the potential risk of fire.
6. Record the incident on the company database or filling register.

Procedures

Because large scale fires may spread very fast it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided at strategic locations throughout the site, in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguishers, hose reels and hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and national standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedure to follow in the case of an emergency.

a) Procedure for initial actions

Persons should not fight the fire if any of the following conditions exist:

- They have not been trained or instructed in the use of a fire extinguisher.
- They do not know what is burning.
- The fire is spreading rapidly.
- They do not have the proper equipment.
- They cannot do so without a means of escape.
- They may inhale toxic smoke.

b) Reporting procedures

In terms of the requirements of NEMA, the responsible person must, within 14 days of the incident, report to the Competent Authority, as well as the provincial head of department (for environmental affairs) and municipality.

- Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities
- The Site manager must have copies of the report form to be completed.

6.3 Programmes

6.3.1 Environmental Awareness programme

It is crucial that each employee and visitor to the site is aware of the impact that their actions may have on the environment. Each employee will be required to attend an environmental awareness training session as induction to the site, and ongoing toolbox talks and sharing of lessons learnt are encouraged. Passive environmental awareness measures should also be implemented such as having informative posters placed around the construction camp, and appropriate signage where necessary (such as no-smoking signs near fuel storage areas). Emergency procedures should also be provided for in this environmental awareness plan.

6.3.1.1 Training

All employees and site personnel must undergo environmental awareness training at the start of the project. Each attendee must sign an attendance register on completion, and this must be kept by the Contractor and Project Manager. All employees and site personnel must be made aware of this EMPr and their role in the implementation of it.

An example of a presentation that may be used for training is appended to this report as Annexure C. The ECO (or ESO, under the guidance of the ECO) will provide the training and may provide the material. As a minimum, the following condition must be included:

- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
- Personnel should not be allowed to wander off the construction site.

The social specialist recommended that the construction workers should be educated about their expected behaviour, and the dangers of contracting sexually transmitted diseases such as HIV/Aids. The EAP recommends that this be included in the training required by the OHS.

6.3.1.2 Emergency procedures

The Contractor team must adhere to the OHS. In case of an emergency occurring on site, the team must react efficiently to reduce the potential impact. Emergencies on a construction site may include physical harm/ death; fire; spills or leakages.

A method statement must be provided by the Contractor for the emergency procedures for fire, accidental leaks and spillages of hazardous materials. This must include:

- Who shall be notified in the event of an emergency, including contact numbers for the relevant authority;
- Where and how any hazardous spills will be disposed of;
- The size of spillage which the emergency procedures could contain;
- Location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.

Contact information for the emergency services in the area must be displayed in an accessible location. Appropriate emergency training (e.g. fire-fighting, first aid, etc.) must be given to members of the construction team prior to the construction period.

An incident/ complaints register must be established for emergencies and maintained on-site. Record of near misses should also be made. Corrective action must be undertaken immediately if a complaint is received, or a leak or spill, fire or injury is identified

Annexure A- EAP CV

Qualifications

MPhil: Environmental Law

BTech Forestry

NDip Forestry

Professional registrations

Member, International Association for Impact Assessment South Africa (IAIASa)

Specialisation

Environmental assessments

32

years in industry



Charles Norman

Environmental Specialist

Charles is a principal environmental practitioner with three decades' experience in environmental services. His technical proficiency and strategic thinking, along with his international environmental experience, place him in a strong position to advise environmental impact assessment (EIA) teams on the integration of technical pragmatism and due environmental processes. His extensive review experience has placed him in a key role mentoring environmental assessment practitioners within Aurecon and coordinating the advisory and delivery functions of projects.

He has worked in a number of countries on a variety of environmental assessments and environmental planning assignments for a range of local and internationally funded public and private sector projects. His experience is predominantly related to large infrastructure, energy, mining and manufacturing projects across Africa and in Australia.

Charles holds a Master's Degree in Environmental Law from the University of Cape Town in South Africa. He also obtained a Bachelor of Technology in Forestry from the Nelson Mandela University in Port Elizabeth in 1999.

Experience

Environmental services for the implementation of Phase 1 of Welmoed Estate mixed-use housing development, Provincial Government of the Western Cape (PGWC): Department of Human Settlements (Western Cape Province, South Africa) 08/2020 – present, Project Leader.

The Department of Human Settlements is implementing the largest greenfield housing development in Cape Town which forms part of the Southern Corridor Integrated Human Settlement Programme. Phase 1, the Southern Precinct, is in the process of being developed and Zutari was contracted to provide environmental services on the project, which includes environmental monitoring as the environmental control officer (ECO) during construction; botanical search and rescue; development of wetland rehabilitation areas; and advisory for the requisite biodiversity offset.

Environmental impact assessment for Penhill greenfields development project, Provincial Government of the Western Cape (PGWC): Department of Human Settlements (Western Cape Province, South Africa) 12/2016 - present, Project Leader.

The Department of Human Settlements is establishing a housing development to cater for approximately 8 000 units as part of the Southern Corridor initiative to upgrade informal settlements within the City of Cape Town. Aurecon was appointed to undertake an environmental impact assessment (EIA) and subsequent amendment for this greenfields housing development and is currently

appointed as the Environmental Control Officer (ECO) during construction. Responsible as project leader.

Aga Khan Hospital Kampala, Aga Khan University Hospital (AKUH) (Kampala, Uganda) 09/2016 - 06/2017, Reviewer.

Aga Khan University Hospital (AKUH) intends to develop a 600-bed hospital on a 60 acre site at the junction of Jinja and New Port Bell Rd in Nakawa, Kampala. The initial phase of the project known as the "Launch Phase" will be developed on a 7 – 10 acre portion of the site and will consist of a 50-bed hospital with an estimated 14 300 m² gross building area. In terms of the scope of works, the launch phase will consist of acute bed units; intensive care units; high-dependency units; surgical suites; imaging suites; cardiac catheterization ("cath") laboratory; as well as labour and delivery suites. Aurecon will be providing full engineering services including geotechnical; civil; structural; wet services; fire safety and protection; mechanical; electrical; electronic (ICT, fire detection, audio visual and security) and acoustics; environmentally sustainable design (ESD) monitoring and management, provision of cost estimates and BOQs. Responsible for review of project reporting and liaison with sub-consultants.

Design of Mizingani seawall and promenade, Phase IIA, Tanzania Ministry of Finance (Zanzibar City, Zanzibar) 12/2013 - 05/2018, Environmental Control Officer (ECO).

The Revolutionary Government of Zanzibar (RGoZ), through its Zanzibar Urban Services Project (ZUSP), appointed Aurecon to lead a consortium of six consultancy companies for the design of the 340 m-long vertical seawall, with a 5 m-wide sea reclamation, along Mizingani Road. Based on design work completed under the Aga Khan Trust for Culture's (AKTC's) technical support, Aurecon's scope of work included detailed design of the seawall and promenade; the preparation of construction drawings, specifications, contract packages and tender documents; building condition assessment and review of the environmental and social management plan (ESMP). Responsible for auditing the site to ensure adequate implementation of environmental controls.

Mossel Bay Upgrading of Informal Settlements Programme (UISP). (Western Cape Province, South Africa) 01/2017 – 07/2018, Phase Leader.

The Mossel Bay Municipality appointed Aurecon to provide project management services for informal settlement upgrading in the Local Municipality via the UISP, as a follow on to the National Upgrading Support Programme (NUSP). Aurecon's scope of works included the project planning, procurement of requisite planning and environmental permissions and implementation oversight for 22 settlements. Responsible as phase leader for the Environmental Impact Assessment component, included managing specialist input and facilitating Environmental Authorisations (Mossel Bay Municipality).

Project information memoranda (PIM) for Mtwara Port and the Mtwara/Mikindani municipal master plan, Development Bank of Southern Africa (DBSA) (Mtwara Region, Tanzania) 08/2014 - 09/2015, Environmental Process Advisor.

The project entailed the development of project information memoranda (PIM) for Mtwara Port, which entailed a review of the Mtwara Port feasibility study of 2012 and other related material that would assist in the preparation of a bankable PIM. The project also involved the development of the Mtwara/Mikindani detailed municipal land use master plan to collect baseline spatial data that can assist in understanding the growth projections for the city and proposing suitable physical and social infrastructure and land uses to accommodate the growth. Responsible for liaising with the authority, coordination of sub-consultants and review.

Coleambally Solar Farm (New South Wales, Australia) 11/2019 – 12/2019 Team Member.

Aurecon was appointed by Neoen, which owns the Coleambally Solar Farm, to address annual reporting requirements mandated under its Syndicated Facility Agreement (SFA). The assignment required the review of the Environmental Impact Statement (EIS), the Conditions of Consent issued for Modification 1 (Mod 1), relevant management plans and licences, and the Equator Principles to identify compliance against each. This included a review of site specific environmental and approvals documentation and an interview with staff. (Neoen)



Tallawarra-B Power Station (New South Wales, Australia) 11/2019 – present. Team Member.

Aurecon was appointed by Energy Australia which owns the Tallawarra Power Station to undertake a modification to an approval granted on 21 November 2010. The modification involved a change to the description in a Condition of Approval to allow for a range of open cycle gas turbine (OCGT) units to be utilised at the time of development. (EnergyAustralia)

Mossel Bay NUSP participatory based planning support, Department of Human Settlement (DHS) (Western Cape Province, South Africa) 08/2015 - 11/2017, Environmental Specialist.

The National Department of Human Settlements appointed Aurecon to provide participatory based planning support for informal settlement upgrading in Mossel Bay Local Municipality via the National Upgrading Support Programme (NUSP). Aurecon's scope of works included the production of an assignment implementation plan, upgrading plans and sustainable livelihoods programmes for 18 settlements, community capacity building programme, and a skills transfer report. Responsible as project leader for the screening of environmental constraints and preparation of applicability checklists for the competent environmental authority.

Impofu Windfarm 132kV Transmission Line EIA. (Eastern Cape Province, South Africa) 07/2019 – 02/2020. Project Leader.

The client proposed to build three windfarms at Jeffrey's Bay and an associated 120km 132kV transmission line for power evacuation to the Chatty Substation in Nelson Mandela Bay Metropolitan Municipality. This component of the project requires a Basic Assessment impact study to run in parallel with the EIAs being conducted for the wind farms and includes the assessment of a 2km wide corridor within which the transmission line would run. (Red Cape Energy)

Nuweveld Windfarm 400kV Transmission Line EIA. (Western Cape Province, South Africa) 05/2019 – 04/2020. Project Leader.

The client proposed to build three windfarms at Nuweveld farming area and associated 100km long 400kV transmission line for power evacuation to the Droerivier Substation near Beaufort West. This component of the project required a Scoping and EIA study to run in parallel with the EIAs being conducted for the wind farms, which included an investigation of constraints and a screening of options study of two 3km wide corridors prior to commencing with the EIA. (Red Cap Energy)

Newcastle Power Station Project EIS (New South Wales, Australia) 06/2019 – 08/2019. Team Member.

Aurecon was appointed by AGL Energy Limited which owns and operates the Newcastle Power Station to compile an Environmental Impact Statement to meet the requirements of a SEAR issued to AGL in accordance with Section 5.16 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The proposal was declared a controlled action and was thus assessed under Section the accredited process of Division 5.2 of the EP&A Act. (AGL Energy Limited).

Closure and Rehabilitation of Kerosene Vale Ash Repository (KVAR) Stage 2 (New South Wales, Australia) 06/2018 – 07/2018. Phase leader.

Aurecon was appointed by EnergyAustralia which owns and operates Kerosene Vale Ash Repository (KVAR) Stage 2 to undertake an Environmental Assessment to support an application under the former Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act) to modify PA 07_0005 to allow for the proposed closure and rehabilitation of KVAR Stage 2. This would occur as part of the rehabilitation of the wider Wallerawang Ash Repository. Responsible for the coordination of Noise and Vibration, Visual, Traffic and Air Quality desktop studies. (EnergyAustralia).

Botswana-South Africa (BOSA) Transmission Interconnection Project ESIA. (Botswana and South Africa) 09/2018 – 12/2019. Environmental and Social Analyst.

The client identified the BOSA Transmission Interconnection Project as one of the initiatives to reduce electricity supply constraints and assist in improving distribution of electricity in the Southern African region. Eskom of South Africa (Eskom) and the Botswana Power Corporation (BPC) will be the beneficiaries of the project. Aurecon was appointed to undertake the Preliminary Design and the Environmental and Social



Impacts Assessment (ESIA) on a transmission corridor for a 400kV transmission power line. The proposed 210 km transmission line stretches between the Mahikeng area in South Africa and Gaborone in Botswana (South African Power Pool)

Prefeasibility Environmental and Social Screening for Luapula River Hydroelectric Scheme. (Zambia and Democratic Republic of Congo (DRC)) 06/2019 – 11/2019. Environmental Leader.

The client identified the Luapula River Hydroelectric Scheme as one of the initiatives to reduce electricity supply constraints in the Southern African region. Société Nationale d'Electricité of the DRC (SNEL) and Zambia Electricity Supply Corporation (ZESCO) will be the beneficiaries of the project. Aurecon, with AF-Consult, were appointed to undertake the Prefeasibility Environmental and Social Screening for a number of components of a cascading series of hydro power plants on the Luapula River between Zambia and the DRC. (South African Power Pool)

Proposed hydropower station and associated infrastructure at Riemvasmaak (Northern Cape Province, South Africa) 02/2012 - 06/2017. Technical Advisor.

Aurecon was appointed to provide the lead consultancy services for the environmental impact assessment (EIA) for the proposed 25 MW hydropower station at Riemvasmaak on the Orange River, adjacent to the Augrabies National Park. Responsible for providing advice on legal procedure and technical project aspects. (Riemvasmaak Hydro Electric Power (Pty) Ltd).

Upgrading of DR1609 and portion of DR01625, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works, 12/2005 - 12/2017, Environmental Specialist

Aurecon was appointed to undertake design and authorisation services for the upgrading of the DR1609 and a portion of DR01625 in Rondevlei, Western Cape, which is adjacent to the Garden Route National Park and crosses within a Ramsar protected wetland. The scope of works included the preparation of an environmental impact assessment (EIA). Responsible as project leader for the EIA component, including leading the compilation of the EIA and coordinating specialist inputs.

Upgrading of Plettenberg Bay Airport, Western Cape Province, South Africa, Bitou Local Municipality, 09/2016 - 06/2017, Environmental Specialist

Bitou Municipality intends to upgrade the Plettenberg Bay Airport in the Western Cape Province, including adding additional infrastructure and hangars to comply with Civil Aviation Authority (CAA) regulations. Responsible for compilation of an environmental constraints analysis.

Proposed hydropower station and associated infrastructure at Riemvasmaak, Northern Cape Province, South Africa, Riemvasmaak Hydro Electric Power (Pty) Ltd, 02/2012 - 06/2017, Technical Advisor

Aurecon was appointed to provide the lead consultancy services for the environmental impact assessment (EIA) for the proposed 25 MW hydropower station at Riemvasmaak on the Orange River, adjacent to the Augrabies National Park. Responsible for providing advice on legal procedure and technical project aspects.

Perdekraal East Wind Farm environmental and social due diligence (ESDD), Western Cape Province, South Africa, African Infrastructure Investment Managers (AIIM), 11/2016 - 04/2017, Project Leader

In order to consider providing funding for the development of the Perdekraal East Wind Farm, the client required the undertaking of an environmental and social due diligence (ESDD) study, including an environmental and social action plan (ESAP), to ensure that environmental authorisations in place were compliant with the requirements of the IFC. Responsible for the compilation of the ESDD and ESAP and coordination of specialist inputs.

Curepipe Point wind farm assessment, Mauritius, Southern Energy Holdings, 05/2016 - 06/2016, Environmental Specialist

Aurecon was appointed to undertake a fatal flaw review of a 29 MW wind energy development near the town of Curepipe in Mauritius. Responsible for the review of an environmental impact assessment (EIA) study as well as the identification and evaluation of environmental risks.

Environmental and social impact assessment (ESIA) for the Makambako Wind Farm, Njombe Region, Tanzania, Windlab Limited, 11/2015 - 03/2017, Project Leader

Windlab Tanzania SPV 1 Limited (Windlab) want to construct a wind farm and associated infrastructure, including a transmission line (project referred to as the Miombo Hewani Wind Farm) with a generation capacity of between 100 MW and 300 MW north of Makambako in the Njombe Region, Tanzania. Aurecon was appointed to undertake the requisite environmental process on behalf of Windlab as required in terms of the Environmental Management Act (Act 20 of 2004) (EMA). Responsible for leading the team of specialists and sub-consultants to develop an IFC compliant ESIA.

Working for Wetlands Plan 2014 - 2017, National, South Africa, South African National Biodiversity Institute (SANBI), 06/2013 - 09/2016, Environmental Advisor

Aurecon was appointed in 2010 for a three year cycle for the design, planning, environmental, project and risk management of the South African Government's Working for Wetlands Programme, which is a nationally run initiative by the South African National Biodiversity Institute (SANBI). The programme's objective is to rehabilitate damaged wetlands and to protect wetlands throughout South Africa, with an emphasis on complying with the with an emphasis on complying with the principles of the expanded public works programme (EPWP) through employing only local small, medium and micro enterprises (SMMEs). Responsible for a review and giving advice on legal process requirements.

Kinangop Wind Farm Phase 1A status review and risk assessment, Nakuru, Kenya, Kinangop Wind Park, 11/2015 - 03/2016, Environmental Specialist

Following termination of the engineering, procurement and construction (EPC) contract, Aurecon was appointed to assess the project status and risks associated with remobilising the Kinangop Wind Farm project. Responsible for environmental review.

Pre-feasibility study for Rukwa coal-to-power project, Mbeya, Tanzania, Rukwa Development Company, 11/2014 - 09/2015, Team Member

Aurecon was engaged by Kibo Mining to carry out a pre-feasibility study for a coal-fired power station to be located adjacent to an opencast coal mine in the Rukwa region of Tanzania. The study included preliminary environmental assessments of the power station and the mine, power evacuation assessment, power station design and modelling of various configurations, reporting and technical input to the project financial model. Responsible for contributing to the drafting of an environmental and social prefeasibility study.

Environmental impact assessment (EIA) for the construction of the AfriSam cement factory, Western Cape Province, South Africa, AfriSam South Africa (Pty) Ltd, 02/2011 - 09/2015, Project Leader

AfriSam was looking to enter the Western Cape market, and consequently decided to fund the construction of a cement factory and associated infrastructure. Aurecon was appointed to undertake an environmental impact assessment (EIA) process for the cement plant, mine and associated infrastructure located on Farm 1139 in the Saldanha industrial area. Services involved undertaking and managing the EIA process, traffic impact study (TIS), surface water investigation and social impact assessment (SIA). Responsible for project management, client and authority liaison, coordination of technical information and specialists inputs, management of public processes, EIA and compilation of an environmental management plan (EMP) report.

Environmental screening of a potential wind energy site, Tanzania, Windlab Limited, 02/2015 - 04/2015, Project Leader/Technical Coordinator

Aurecon was appointed to determine the feasibility of establishing a wind energy facility (WEF) in Tanzania. As part of evaluation Aurecon was appointed to undertake a comparative environmental constraints



analysis, including the biophysical, social and heritage aspects of the identified sites. Responsible for the identification and assessment of environmental constraints.

Western Cape road materials supply strategy, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works (DTPW), 06/2008 - 03/2015, Principal Environmental Practitioner

Increasing pressures from tightened environmental legislation have resulted in lengthy waiting periods (about 18 months) for identifying required material sources. The wait is also caused by investigation phases, getting approval from the Mineral Resources and Petroleum Development Act (DMR), the Department of Environmental Affairs and Development Planning (DEADP), the National Environmental Management Act (NEMA) and the Land Use Planning Ordinance (LUPO). Aurecon was responsible for prospecting suitable road making materials, sampling, testing, and identifying technically suitable sources to be used for both identified projects and as strategic pits, as well as for getting all the required approvals. Responsible for planning of authorisation processes and review of submissions. Also responsible for liaison with authorities and partner consultants.

Upgrading of Distillery Road in Wellington, Western Cape Province, South Africa, Drakenstein Local Municipality, 10/2013 - 02/2015, Project Manager

The project entailed a basic environmental impact assessment (EIA) for the proposed upgrading of Distillery Road in Wellington, including a heritage assessment. Responsible for project management, client and authority liaison, coordination of specialist input and review of final reports.

George mobility strategy for the improvement of public transport, Western Cape Province, South Africa, Provincial Government of the Western Cape (PGWC): Department of Transport and Public Works (DTPW), 09/2003 - 02/2015, Consulting Team Member

This broad based mobility strategy project, which is centred on the improvement of public transport in the George municipal area, is one of many national interventions to upgrade public transport in South Africa. The objective is the transformation of the existing bus and minibus taxi industry into a single entity contracted to the local authority to provide scheduled, subsidised public transport services. Work has included detailed operational design and costing; contract development as well as planning for the upgrading of road and other infrastructure, including a bus stop, a temporary bus depot, and an inter-urban bus station. The project has also comprised a considerable amount of engagement with the local bus and minibus industry representatives as well as broad based public consultation. Responsible for the advisory role on environmental constraints for implementation of public transport initiative.

Feasibility study for the Knysna-Bitou water supply scheme, Western Cape Province, South Africa, Eden District Municipality, 01/2013 - 12/2014, Project Member

The project involved the identification of the water resource and bulk water requirements of the local municipalities of Knysna and Bitou for the next 20 years and exploring the technical and economic viability of integrating the bulk water supply systems serving the towns of Knysna and Plettenberg Bay. Responsible for the identification and evaluation of environmental constraints for the screening of options exercise.

Environmental constraints analysis of potential wind energy sites near Aberdeen, Eastern Cape Province, South Africa, Juwi Renewable Energies (Pty) Ltd, 06/2013 - 08/2014, Project Leader/Technical Coordinator

The client wished to determine the feasibility of establishing a wind energy facility at Aberdeen in the Eastern Cape. As part of evaluation Aurecon was appointed to undertake a comparative environmental constraints analysis, including the biophysical, social and heritage aspects of the identified sites. Responsible for contributing to identification and assessment of environmental constraints. Also responsible for constraints identification and evaluation as well as a review.



Water augmentation study for the Bitou Local Municipality, Western Cape Province, South Africa, Bitou Local Municipality, 10/2009 - 03/2014, Environmental Scientist

The Wadrif 1E Dam scheme was for the augmentation of the bulk water supply to the Plettenberg Bay area. Aurecon's project scope focused on the Wadrif 1E off-channel dam and included a basic assessment process for an emergency pipeline and the remainder of the pipeline in terms of the relevant environmental legislation. An application for a licence to store was made in terms of the National Water Act, 1997 (NWA) and a forestry permit application for a drilling site investigation for the Wadrif 1E Dam site and for dam construction. Responsible for the management of specialist environmental impact assessment (EIA) consultant and review of all reports.

Independent review of environmental impact assessment (EIA) applications, Western Cape Province, South Africa, Department of Environmental Affairs and Development Planning (DEA&DP), 03/2011 - 12/2013, Task Leader

The purpose of the project was to review contentious environmental impact assessment (EIA) applications in terms of the National Environmental Management Act 107 of 1998 (NEMA) to support authority decision making. Responsible for project management, client liaison, advisory role to team members and review and coordination of final products.

Pilot catchment management plan: Kyoga water management zone, Kampala, Uganda, The World Bank, 12/2012 - 12/2013, Co-author of report

Aurecon was appointed to prepare a pilot catchment management plan (CMP) for the Awoja Catchment. Major social and environmental issues within the catchment area were identified early in the process as critical informants to catchment management planning so these can be integrated into the planning process at an early stage. The rapid strategic environmental assessment (RSEA) focussed on identifying the issues and conditions in the catchment related to water and natural resources that are likely to be a major influence and that might represent important risks, as linked to potential water resource development options. Responsible for contributing to the coordination of and reporting on implementation options.

Update to rapid strategic environmental assessment (RSEA): development of a pilot catchment management plan (CMP), Kampala and Mbale, Uganda, Ministry of Water and Environment (Uganda), 12/2012 - 11/2013, Project Member

This water management and development project (WMDP) for Uganda comprised the development of a pilot catchment management plan (CMP) in the Kyoga water management zone (WMZ). The CMP outlines the changes required and the benefits of these changes towards ensuring sustainable development and the equitable distribution of the resulting benefits. The integrated water resources management-based (IWRM-based) CMP provides an integrated strategy for the sustainable water resource management in the pilot Kyoga WMZ catchment. Responsible for the coordination of and reporting on implementation options.

Operational environmental management plan (EMP) for Shoprite Checkers, Western Cape Province, South Africa, Shoprite Checkers, 04/2010 - 07/2013, Task Leader

The project included the compilation of an operational environmental management plan (EMP) to meet the local municipality's requirements for the new shopping centre at Sandown Road in Cape Town. Responsible for project management, client and authority liaison and the compilation of EMP report.

Environmental impact assessment (EIA) for the Riemvasmaak Hydropower Station, Northern Cape Province, South Africa, Mulilo Renewable Energy (Pty) Ltd (MRE), 12/2011 - 06/2013, Technical Advisor

Aurecon was appointed to submit a proposal to undertake an environmental impact assessment (EIA) for the construction of a hydropower station on the Riemvasmaak Farm north of Augrabies Falls National Park. Services provided included legislation and policy review, strategic review, public consultation, EIA coordination and facilitation and various specialist disciplines. Responsible for providing advice on the legal procedure and technical project aspects.



Exploratory drilling environmental management plan (EMP), Tete Province, Mozambique, Coal India Africana Limitada (CIAL), 02/2012 - 04/2013, Project Leader

The project entailed the compilation of an environmental management plan (EMP) for exploratory drilling operations for coal prospecting in Moatize. Responsible for client liaison, project management, coordination of team members and review of final products.

Environmental management plans (EMPs) for coal bed methane prospecting activities, Tete Province, Mozambique, Rio Tinto Coal Mozambique (RTCM), 07/2012 - 02/2013, Project Member

Aurecon was appointed by Rio Tinto to compile the environmental management plan (EMP) for the coal bed methane (CBM) prospecting activities in each of the lease areas, ensuring the necessary licensing of the activities. Responsible for project management, coordination of information and team inputs.

Social and environmental impact assessment (SEIA) for the Rössing Uranium Mine expansion project, Erongo Region, Namibia, Rössing Uranium Mine, 09/2009 - 08/2012, Project Member

Rössing Uranium wanted to obtain environmental authorisations for the expansion of the mine to increase production and extend the life of the mine. Aurecon undertook a social and environmental impact assessment (SEIA) to determine the environmental impacts brought about by the proposed activities, proposed measures to minimise detrimental impacts or enhance positive impacts and presented the findings to the Namibian authorities. The SEIA included two primary product deliverables, namely the environmental scoping report (ESR) and the subsequent SEIA report. Responsible for providing support to the team appointed to facilitate the required environmental authorisations for the expansion of the Rössing Uranium Mine, including the review of legislative requirements and specialist reports.

Bankable feasibility study (BFS) for a Zuma Energy project, Kogi State, Nigeria, Zuma Energy Nigeria Limited, 10/2011 - 01/2012, Project Leader

Zuma Energy Nigeria Ltd was planning to construct and operate a 1 200 MW coal-fired power station along the Niger River. Aurecon prepared a bankable feasibility study (BFS) using a gap analysis of all existing documents and work already done by Zuma Energy. The study included a review of the environmental and social issues by conducting an environmental and social impact assessment (ESIA) to determine adequacy and compliance to the Nigerian Statutory requirements and the World Bank's standard Equator Principles (EPs) and to a level suitable for financial closure. Responsible for the review of final report against World Bank standards and EPs.

Independent review of environmental impact assessment (EIA) for report, KwaZulu-Natal Province, South Africa, Knight Piésold, 11/2011 - 12/2011, Consulting Team Member

The purpose of the project was to review the environmental impact assessment (EIA) process undertaken by Knight Piésold for a bulk water supply pipeline in KwaZulu-Natal. Responsible for the review of impact assessment methodology.

Pre-feasibility study on the Great Lakes Railway, Burundi, Rwanda, Tanzania, Uganda and Zambia, Common Market for Eastern and Southern Africa (COMESA), 03/2010 - 12/2011, Consulting Team Member

The project entailed a pre-feasibility study to improve port, inland waterway and rail inter-connectivity in the Great Lakes Region (Lake Kivu, Lake Edward, Lake Tanganyika, Lake Victoria and Lake Albert) based on several transportation constraints experienced. The primary objective was reduced transportation costs for the provision of rail links to connect existing rail networks with each other, and the development of the inland water transport services across lakes within the region. The work included a pre-feasibility study that consisted of resource mapping, traffic forecasts, alignment surveys, engineering cost estimates, an environmental impact assessment (EIA), institutional review, financing mechanisms review and economic evaluation and feasibility study. Responsible for authority consultation, site inspection and review of proposed rail alignments and reporting on environmental constraints.



Application for an atmospheric emissions licence (AEL) in Albertinia, Western Cape Province, South Africa, South Cape Poles, 03/2007 - 11/2011, Task Leader

The project entailed facilitating an application for an atmospheric emissions licence (AEL) in terms of the National Environment Management (NEM): Air Quality Act (No 39 of 2004) for the operation of a creosote treatment facility in Albertinia. Responsible for project management, client and authority liaison, coordination of specialist inputs and final report compilation.

Environmental impact assessment (EIA) for the Moatize Coal Mine expansion, Tete Province, Mozambique, Vale Moçambique Limitada, 03/2010 - 09/2011, Assistant Project Leader

The aim of the project was to expand operations at Moatize Coal Mine due to the favourable global market for coal. Aurecon was appointed to undertake separate environmental impact assessments (EIAs) for each of the proposed components of the project. The particular work plan addressed EIA Package 1, which was for the proposed expansion of the mine at Moatize and related infrastructure. Responsible for client and specialist liaison, coordination of technical information and review of final reporting.

Environmental impact assessment (EIA) for the Nacala Rail Corridor, Malawi and Mozambique, Vale Moçambique Limitada, 03/2010 - 09/2011, Project Member

The project entailed the completion of four environmental impact assessments (EIAs) for the upgrading of existing and the construction of new railway sections along the Nacala Corridor from the Moatize Coal Mine in Mozambique, through Malawi, to the Port of Nacala, and a new coal handling terminal. This particular work plan addressed Packages 2 to 5, which were for the components of the Nacala Logistics Corridor. Responsible for client and specialist liaison, coordination of technical information and review of final reporting.

Decommissioning of the Sonae Novobord board manufacturing plant in George, Western Cape Province, South Africa, Sonae Novobord, 07/2009 - 07/2011, Project Leader/Manager

Aurecon was appointed to prepare an environmental management plan (EMP) for the decommissioning of Sonae Novobord's board manufacturing and veneering plant in George. Responsible for project management, client and authority liaison and review of the final EMP report.

Upgrading of Merweville wastewater treatment works (WWTW), Western Cape Province, South Africa, Beaufort West Local Municipality, 02/2007 - 06/2011, Project Manager

The project entailed the facilitation of the required environmental authorisation and waste licence for the upgrading of the wastewater treatment works (WWTW) in Merweville. Responsible for project management, review of final reports.

Emergency desalination plant for Mossel Bay, Western Cape Province, South Africa, Mossel Bay Local Municipality, 05/2010 - 01/2011, Environmental Assessment Practitioner

The Mossel Bay Local Municipality appointed Aurecon to undertake an environmental impact assessment (EIA), which is required by Act 107 of 1998 of the National Environmental Management Act (NEMA), to assess the potential impacts related to the construction and operation of a 15MI/day emergency desalination plant in the Voorbaai area. Aurecon was responsible for consultation with the authorities throughout the EIA to confirm that all potential issues were identified; for the compilation of a report that provided a detailed description of the potential impacts associated with the development, and the findings; an evaluation of the potential impacts; and recommendations regarding mitigation and the way forward. Responsible for project management, review of EIA and environmental management plan (EMP) reports.

Environmental impact assessment (EIA) for infrastructure upgrades at the Etosha National Park, Oshikoto Region, Namibia, Millennium Challenge Account (MCA), 04/2010 - 11/2010, Consulting Team Member

The project entailed the completion of two environmental impact assessments (EIAs), including environmental management plans (EMPs), for the construction of staff housing and management centres at the Ombika and Galton gates as well as the Okaukuejo and Otjovasandu villages in the Etosha National Park. The aim was to improve the quality of infrastructure to attract senior management to the park to ensure



that the park retains its status as a premier tourist destination. Responsible for the review of specialist reports and final reporting.

Pre-feasibility (FEL 2) social and environmental screening of rail corridor alternatives through Malawi, Southern Region, Malawi, Vale Moçambique Limitada, 09/2009 - 09/2010, Principal Environmental Practitioner

The project involved a pre-feasibility (FEL 2) level investigation into alternative routes for the proposed railway alignment section between Moatize in Mozambique and the Nkaya Junction in Malawi. Aurecon prepared the social and environmental screening report, which provided a background to the methodology for environmental (social and biophysical) screening. A high-level impact study and comparative assessment of alternative alignments were undertaken to determine the most environmentally responsible and sustainable options. Responsible for gathering field data and contribution to the screening report.

Independent review of environmental impact assessment (EIA) applications for the Department of Economic Development, Environment and Tourism, Eastern Cape Province, South Africa, Department of Economic Development, Environmental Affairs and Tourism, 02/2007 - 07/2010, Project Manager

The project entailed the review of environmental impact assessment (EIA) applications to assist with the processing of backlog applications in terms of the Environment Conservation Act (Act 73 of 1989) (Cacadu Region). Responsible for project management, liaison with authorities and applicants, advising authorities on fatal flaws and policy conflicts, drafting environmental authorisations and training authority staff.

Relocation of the Sedgefield water treatment works (WTW) and associated infrastructure, Western Cape Province, South Africa, Knysna Local Municipality, 12/2004 - 06/2010, Project Manager

The purpose of the project was to undertake an environmental impact assessment (EIA) to facilitate the relocation of the Sedgefield water treatment works (WTW) out of a floodplain. Responsible for managing the basic assessment reporting procedure for the relocation. Also responsible for project management, client liaison and the identification and assessment of impacts.

Independent review of environmental impact assessment (EIA) applications for the Department of Environmental Affairs and Development Planning (DEA&DP), Western Cape Province, South Africa, Department of Environmental Affairs and Development Planning (DEA&DP), 04/2009 - 05/2010, Project Leader

The project entailed the review of environmental impact assessment (EIA) applications and appeals to assist the competent authority with the processing of backlog applications in terms of the Environment Conservation Act (Act 73 of 1989) and the National Environmental Management Act 107 of 1998 (NEMA). Responsible for project management, client liaison, staff advisory and review of all final submissions.

Decommissioning of creosote treatment facility at Tergniet, Western Cape Province, South Africa, Outeniqua Pale (Pty) Ltd, 06/2007 - 04/2010, Project Manager

Aurecon was appointed to facilitate the relocation of Outeniqua Pale's timber treatment works, including a waste licence for the decommissioning of a site contaminated with hazardous waste and the drafting of an environmental and health impact assessment (EHIA) on instruction from the Environmental Management Inspectorate (EMI). Responsible for project management, client and authority liaison, advising legal representatives, managing public process and the compilation of the final EHIA and environmental management plan (EMP) reports.

Environmental management plan (EMP) for Garden Route Casino, Western Cape Province, South Africa, Garden Route Casino (Pty) Ltd, 12/2008 - 04/2010, Project Leader

Aurecon was appointed to update the environmental management plan (EMP) to accommodate various proposed upgrades to the casino and associated facilities. Responsible for project management, client and authority liaison and review of the final report.

Upgrading of creosote treatment facility at Albertinia, Western Cape Province, South Africa, Outeniqua Pale (Pty) Ltd, 05/2008 - 02/2010, Project Leader

The purpose of the project was to facilitate the upgrading of an unlicensed timber treatment works, including the formulation of environmental management plans (EMPs), at Albertinia, Western Cape. Responsible for project management, client and authority liaison, coordination of specialist input, impact assessment and, advising the client's legal representatives.

Upgrading of the Outeniqua effluent pump station and pipeline, Western Cape Province, South Africa, George Local Municipality, 09/2009 - 08/2010, Project Member

The growth of the residential sectors in George necessitated the upgrading of the existing regional wastewater treatment works (WWTW). Aurecon was appointed for the design, tender compilation and contract supervision for the upgrading of the plant from a capacity of 9.3 Ml/day to 15 Ml/day. The upgrade included the addition of more aerators to the bioreactor, a dissolved air flotation (DAF) unit and a sludge digester. Responsible for managing an application for amendment to an existing authorisation and facilitating the public process.

Upgrading of Hartenbos wastewater treatment works (WWTW), Western Cape Province, South Africa, Mossel Bay Local Municipality, 04/2009 - 07/2009, Project Leader

Aurecon was appointed to facilitate the requisite environmental process for the upgrading of the wastewater treatment works (WWTW) in Hartenbos. Responsible for project management, client and authority liaison and review of the final reports.

Environmental processes for the Beaufort West wastewater reclamation plant, Western Cape Province, South Africa, Water & Wastewater Engineering, 10/2008 - 07/2009, Project Manager

The purpose of the project was to facilitate the requisite environmental processes for the implementation of a wastewater reclamation plant for Beaufort West Municipality, inclusive of a waste licence and environmental authorisation. Responsible for project management, client and authority liaison, management of specialists and public processes and the compilation of final reports.

Alien vegetation eradication and rehabilitation, Fancourt Estate, George, Western Cape Province, South Africa, Fancourt Golf and Country Estate, 2008, Project Manager

The project entailed the formulation of an alien vegetation eradication and rehabilitation plan for the Fancourt landholding on the Malgas River. Responsible for project management, client liaison and report compilation.

Review of the biodiversity components of municipal spatial development frameworks (SDFs) in the C.A.P.E. domain, Western Cape Province, South Africa, South African National Biodiversity Institute (SANBI), 2008, Consulting Team Member

The aim of the project was to provide an overview of the requirements for biodiversity in spatial development frameworks (SDFs), and an assessment of the current status of biodiversity in these SDFs. Responsible for the review of SDFs and final reports.

Additional units at the open cycle gas turbine (OCGT) plant in Mossel Bay, Western Cape Province, South Africa, Eskom, 01/2005 - 01/2006, Consulting Team Member

The project entailed the management of a comprehensive and multi-disciplinary environmental impact assessment (EIA) process for three additional gas turbine units at the peaking generation power plant in Mossel Bay. Responsible for project management assistance, liaison with specialists and report review.

Review of environmental impact assessment (EIA) applications and appeals, South Africa, Provincial Department of Environmental Affairs and Development Planning (DEA&DP), 2004 - 2006, Principal Environmental Officer

The project entailed reviewing environmental impact assessment (EIA) applications and appeals and drafting environmental authorisations. Responsible for reviewing EIA applications, advisory role to competent authority and the drafting of environmental authorisations.

Assessment of plantation plans, George, Western Cape Province, South Africa, Woodifield Farm, 2004, Consultant

The project entailed the evaluation of Woodifield Farm's existing management plans and making recommendations for optimising forestry operations.

Proprietor of Southern Cape environmental services, Western Cape Province, South Africa, 1992 - 2004, Consultant

The project entailed the compilation of a number of environmental management plans (EMPs) and environmental assessments and evaluations for a variety of developments in the Southern Cape. This included the mapping of soils of various Southern Cape forestry plantations and indigenous forests for the Council for Scientific and Industrial Research (CSIR), South African Forestry Company Ltd (SAFCOL), the Department of Water and Sanitation (DWS) and private companies, for productivity and planning purposes as well as the sampling of river water for analysis by Stellenbosch University: Department of Soil Science. Responsible for financial management, project management, report compilation and client liaison.

Plantation environmental auditing, Western Cape Province, South Africa, NCT Forestry Co-operative Limited (NCT), 2003, Consultant

The project entailed the auditing of Van Reenen plantations for compliance with Forestry Stewardship Council (FSC) requirements. Responsible for environmental auditing.

Alien vegetation mapping, Western Cape Province, South Africa, EnviroGIS, 2001 - 2003, Consulting Team Member

Appointed to map and quantify alien vegetation status in the Barrydale, Botvlei, Kamanassi and Karatara catchments.

Western Cape forestry land use study, Western Cape Province, South Africa, Department of Water and Sanitation (DWS), 2001, Project Manager

Appointed and commissioned by Department of International Development (DFID) as project leader and co-author to conduct a study on the Western Cape land forestry land use.

Mapping of soils for forest planning, Western Cape Province, South Africa, Department of Water and Sanitation (DWS), 1988 - 1992, Consulting Team Member

As part of a function while employed at the Council for Scientific and Industrial Research (CSIR), mapped extensive soil bodies within the Southern Cape catchments for productivity evaluation and species choice. Responsible for mapping soil bodies.

Annexure B- Method Statement

METHOD STATEMENT

Contract:.....

DATE:.....

PROPOSED ACTIVITY (Give title of method statement and reference number from the EMPr)

WHAT WORKS IS TO BE UNDERTAKEN (give a brief description of the works):

WHERE WORKS IS TO BE UNDERTAKEN (Where possible, provide an annotated plan and a full description of the extent of the works):

WHAT MATERIALS WILL BE USED?

--

WHAT TYPE OF EQUIPMENT/MACHINERY WILL BE USED?

--

START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:

Start Date:	End Date:
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HOW ARE THE WORKS TO BE UNDERTAKEND?(provide as much detail as possible, including annotated sketches/plans where possible):

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*Note: Please attached extra pages if more specs is required.

Annexure C- Training

ENVIRONMENTAL AWARENESS CURSE

November 2020



ZUTARI IMPACT. ENGINEERED.

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Aire we breath
- Buildings, cars &houses



WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A contract has been signed
- Disciplinary actions (e.g stop works or fines)



HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

- Workers & equipment must stay inside the site boundaries at all times.



RIVERS AND STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in any stream
- Do not work in streams without direct instruction
- Do not damage the banks or vegetation of any stream



ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contracts Manager to remove animals found on site.



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



SMOCKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires
- Know the locations of fire-fighting equipment
- Report all fires
- Don't burn rubbish/vegetation



PETROL, OIL AND DIESEL

- Work with petrol, oil and diesel in marked areas
- Report any petrol, oil and diesel leaks or spills to your supervisor
- Use a drip tray under vehicles and machinery
- Empty drip trays after rain
- Throw away contents



DUST

- Try to avoid producing dust
- Use water to make ground and soil wet



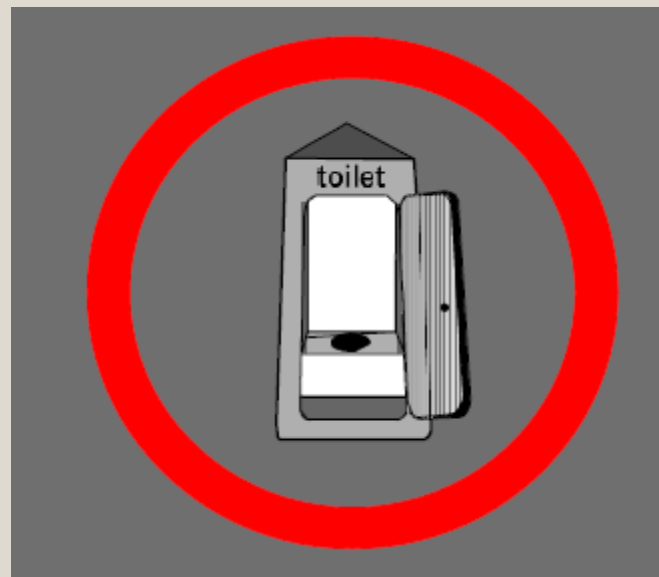
NOISE

- Do not make loud noises around the site, especially near homes
- Report or repair noisy vehicles



TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging and leftover food into rubbish bins



RUBBISH

- Do not litter- put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly



TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers- check and report leaks and vehicles that belch smoke
- Ensure loads are secure and do not spill especially when crossing a river



EMERGENCY PHONE NUMBERS

- **Know all the emergency phone numbers:**
 - Northern Cape Heritage
 - Environmental Control Officer
 - Environmental Site Officer
 - Resident Engineer



FINES AND PENALITES

- Spot Fines of between R20 ad R200
- Your company may be fined
- Removal from site
- Construction may be stopped.



PROBLEMS-WHAT TO DO!

- Report any breaks, floods, fires, spills ad leaks to your supervisor.
- Don't make ASSUMPTIONS!
- Ask questions!



Annexure D- Chance find Protocol

CHANCE FOSSIL FINDS PROCEDURE: Kokerboom 3 Wind Farm & Kokerboom 4 Wind Farm near Loeriesfontein	
Province & region:	NORTHERN CAPE, Namaqua District Municipality (Hantam Local Municipality)
Responsible Heritage Resources Authority	SAHRA (Contact details: P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502)
Rock unit(s)	Ecce Group (Prince Albert, Whitehill and Tierberg Formations) Late Cenozoic alluvium, aeolian sands
Potential fossils	Trace fossils, plant remains, fish, aquatic reptile, shelly fossils and crustacean remains within Ecce Group bedrocks. Mammalian bones and teeth, freshwater molluscs, calcretised root casts, termitaria, ostrich egg shells, land snail shells Late Cenozoic superficial sediments.
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (e.g. rock layering)
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.

In diversity there is beauty
and there is strength.

MAYA ANGELOU

Document prepared by:

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