Draft EIR Report

Development of the 300MW Kokerboom 3 Wind Energy Facility, battery energy storage system and associated infrastructure on Farms 1/214, 2/214 and RE/213 near Loeriesfontein in the Northern Cape

Business Venture Investments No. 2105 (Pty) Ltd (BVI)

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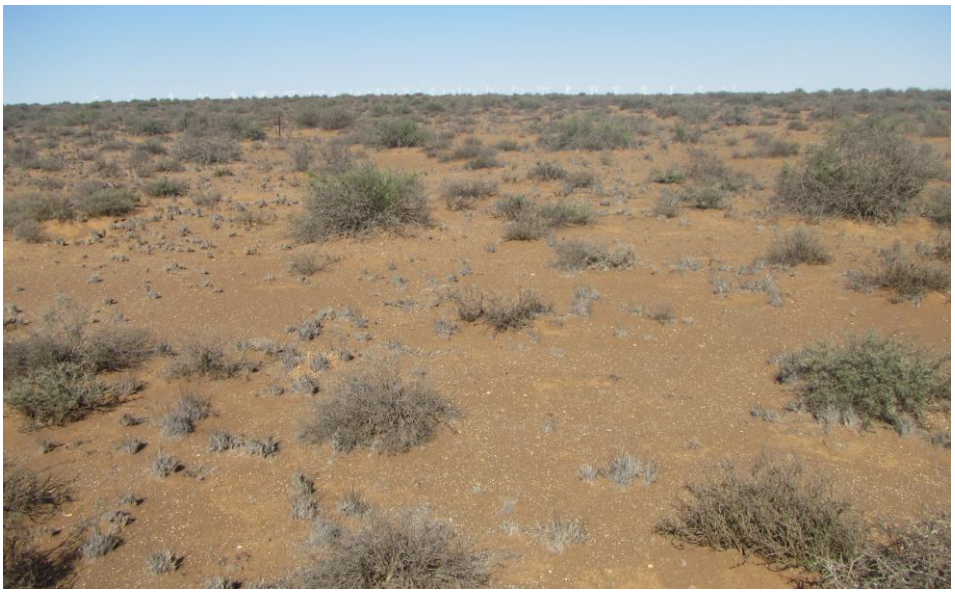
Approval			
Author signature		Approver signature	
Name	Corlie Steyn	Name	Stephan van den Berg
Title	Senior Environmental Consultant	Title	Technical Director

General Site Information Requested by DFFE

<table>
<tr><th>Information Requested by DFFE</th><th>Description / Details</th></tr>
<tr><td>Descriptions of all affected farm portions

21- Digit SG code of all affected farm portions</td><td>
<table>
<tr><th>Name of landowner</th><th>Erf number</th><th>21-digit SG code</th><th>Name of farm</th><th>Farm Size (ha)</th></tr>
<tr><td>Gert Johannes Lombard</td><td>1/214</td><td>C01500000000021400001</td><td>Karree Doorn Pan (Portion 1)</td><td>5,094.23ha</td></tr>
<tr><td>TR2 Immobilien GmbH</td><td>2/214</td><td>C01500000000021400002</td><td>Karree Doorn Pan (Portion 2)</td><td>5,094.24ha</td></tr>
<tr><td>Gert Johannes Lombard</td><td>RE/213</td><td>C01500000000021300000</td><td>Remainder of Aan de Karree Doorn Pan No 213</td><td>2,580.00ha</td></tr>
<tr><td colspan="5">The proposed site is located approximately 60 km north of Loeriesfontein, 85km west of Brandvlei and 160km 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).</td></tr>
</table>
</td></tr>
<tr><td>Copies of landowner consent of all affected farm portions</td><td>Please refer to Annexure G
Annexure G is the Amended Application Form and Appendix 3 contains the landowner details and consent</td></tr>
<tr><td>Central co-ordinates of the site and activity location</td><td>-30.36080° | 19.50710°

Refer also to Figure 1-1 for the Locality Plan</td></tr>
<tr><td>Four corner co-ordinates for the proposed development.</td><td>
<table>
<tr><th>No</th><th>Farm</th><th>Y_dd</th><th>X_dd</th><th>Y_dms</th><th>X_dms</th></tr>
<tr><td>1</td><td>1/214</td><td>-30,317073</td><td>19,526092</td><td>30° 19' 1,463" S</td><td>19° 31' 33,931" E</td></tr>
<tr><td>2</td><td>1/214</td><td>-30,316964</td><td>19,533791</td><td>30° 19' 1,070" S</td><td>19° 32' 1,648" E</td></tr>
<tr><td>3</td><td>1/214</td><td>-30,35111</td><td>19,59366</td><td>30° 21' 3,996" S</td><td>19° 35' 37,176" E</td></tr>
<tr><td>4</td><td>1/214</td><td>-30,361577</td><td>19,578083</td><td>30° 21' 41,677" S</td><td>19° 34' 41,099" E</td></tr>
<tr><td>5</td><td>1/214</td><td>-30,417575</td><td>19,49464</td><td>30° 25' 3,270" S</td><td>19° 29' 40,704" E</td></tr>
<tr><td>6</td><td>1/214</td><td>-30,411087</td><td>19,461922</td><td>30° 24' 39,913" S</td><td>19° 27' 42,919" E</td></tr>
<tr><td>7</td><td>1/214</td><td>-30,376126</td><td>19,506382</td><td>30° 22' 34,054" S</td><td>19° 30' 22,975" E</td></tr>
<tr><td>8</td><td>1/214</td><td>-30,318996</td><td>19,52721</td><td>30° 19' 8,386" S</td><td>19° 31' 37,956" E</td></tr>
<tr><td>9</td><td>1/214</td><td>-30,317073</td><td>19,526092</td><td>30° 19' 1,463" S</td><td>19° 31' 33,931" E</td></tr>
<tr><td>10</td><td>2/214</td><td>-30,317073</td><td>19,526092</td><td>30° 19' 1,463" S</td><td>19° 31' 33,931" E</td></tr>
<tr><td>11</td><td>2/214</td><td>-30,318996</td><td>19,527211</td><td>30° 19' 8,386" S</td><td>19° 31' 37,960" E</td></tr>
<tr><td>12</td><td>2/214</td><td>-30,376126</td><td>19,506382</td><td>30° 22' 34,054" S</td><td>19° 30' 22,975" E</td></tr>
<tr><td>13</td><td>2/214</td><td>-30,411087</td><td>19,461922</td><td>30° 24' 39,913" S</td><td>19° 27' 42,919" E</td></tr>
<tr><td>14</td><td>2/214</td><td>-30,407085</td><td>19,441758</td><td>30° 24' 25,506" S</td><td>19° 26' 30,329" E</td></tr>
<tr><td>15</td><td>2/214</td><td>-30,317921</td><td>19,464824</td><td>30° 19' 4,516" S</td><td>19° 27' 53,366" E</td></tr>
<tr><td>16</td><td>2/214</td><td>-30,317073</td><td>19,526092</td><td>30° 19' 1,463" S</td><td>19° 31' 33,931" E</td></tr>
</table>
Please Refer to Annexure H for the start, middel and end point of linear activities
</td></tr>
</table>

Photos of areas that give a visual perspective of all parts of the site	 **Figure 1: Proposed southern access point looking west with the existing Khobab WEF to the South**  **Figure 2: View of site from Northeast looking south with Khobab WEF in the distance**

<table>
<tr><td></td><td> 
Figure 3: View from the North looking South-east with the Loeriesfontein 2 WEF in the background

 
Figure 4: One of the Ephemeral Pans located on site (VRMA 2020)</td></tr>
<tr><td>Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)</td><td>Few sensitive receptors are in proximity to the proposed wind farm and are assessed in detail in the visual impact assessment. Simulations of the view of the proposed wind farm from the Nuwepos Road (the closest receptor) are presented in the visual impact assessment report (Appendix D). No tourism facilities were identified in the study area.</td></tr>
<tr><td colspan="2">Facility design specifications including:</td></tr>
<tr><td>Type of technology</td><td>Wind Energy – onshore turbines</td></tr>
<tr><td>Number of turbines</td><td>Up to a maximum of 60 wind turbines</td></tr>
<tr><td>Structure height</td><td>For Kokerboom 3 Wind Farm the following wind turbine envelope is proposed:
Rotor diameter: up to 180m (90 m blade)
Hub height: up to 150m
Rotor top tip height: up to 240m
Steel or concrete towers</td></tr>
</table>

Surface area to be covered (including associated infrastructure such as roads)	**Permanent footprint – approximalty 168.2ha** **Temporary construction footprint – approximately 175.6ha**
Structure orientation	**The turbine blades will not be fixed and will be able to rotate in order to catch the prevailing winds.**
Construction laydowm areas	**Temporary construction laydown area – up to 45ha**
Generation capacity	**Up to 6.5MW per turbine, depending on selected technology**
Generation of the facility as a whole at delivery points	**Up to 300MW**

NEMA requirements for Environmental Impact Assessment Report		
Appendix 3	**Content as required by NEMA**	**Section**
3 (1)(a)	(i) details of the EAP who prepared the report; and	Section 1.2.1 and Annexure A
	(ii) details of the expertise of the EAP, including a curriculum vitae;	
(b)	the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	Section 1.1 and Section 5.1
	(i) the 21 digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 5.1
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	Chapter 5
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(d)	a description of the scope of the proposed activity, including-	Chapters 1, 2 and 3
	(i) all listed and specified activities triggered and being applied for; and	Section 2.1
	(ii) a description of the associated structures and infrastructure related to the development'	Chapter 5
(e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Chapter 2
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5.2
(g)	a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 4 and Chapter 8
(h)	a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	Chapter 4
	(i) details of the development footprint alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 3.3 and Annexure C
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 6
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 3.2
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 6
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) if no alternative development footprints for the activity were investigated, motivation for not considering such; and	Chapter 4
	(x) a concluding statement indicating the development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 8
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred	Chapter 6

	development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including -	
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
(j)	an assessment of each identified potentially significant impact and risk, including -	Chapter 6 and Chapter 7
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be mitigated;	
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Chapters 6 and 7 and Section 8.2
(l)	an environmental impact statement which contains -	Section 8.2
	(i) a summary of the key findings of the environmental impact assessment;	Section 8.1
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Chapter 6
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 8.2
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Annexure F
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 8.1
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 8.2
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 3.4 and Annexure D (all specialist reports)
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8.2 and Section 8.3
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalized;	N/A
(s)	an undertaking under oath or affirmation by the EAP in relation to-	Annexure A
	(i) the correctness of the information provided in the reports;	
	(ii) the inclusion of comments and inputs from stakeholders and I&APs;	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs;	
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Annexure F
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including -	N/A
	(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	
	(ii) a motivation for the deviation;	
(v)	any specific information that may be required by the competent authority; and	Annexure B and C
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A
(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	

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Annexure F | Environmental Management Programme and Plans

Annexure G | Application Form (Amended) and Annexures

Annexure H | Additional information requested by DFFE

Annexure I | Maps

GLOSSARY OF TERMS

Environment	The surroundings (biophysical, social and economic) within which humans exist and that are made up of: i. The land, water and atmosphere of the earth; ii. Micro-organisms, plant and animal life; iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and iv. He physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action.
Environmental Impact Report (EIR)	A report assessing the potential significant impacts identified during the scoping phase.
Environmental impact	An environmental change caused by some human act.
Environmental Management Programme (EMPr)	A document that provides procedures for mitigating and monitoring environmental impacts, during the construction, operation and decommissioning phases.
Public Participation Process	A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.
Scoping	A procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined in detail. This results in a Scoping Result that is made available for public comment.
Turbine	A wind turbine is a rotary device that extracts energy from the wind.

ABBREVIATIONS

BA	Basic Assessment
BVI	Business Venture Investments No 1788 (Pty) Ltd (The Proponent)
CAA	Civil Aviation Authority
CBA	Critical Biodiversity Area
CV	Curriculum Vitae
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DEAN	Department of Environmental Affairs and Nature Conservation (Northern Cape)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DoE	Department of Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (No. 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMI	Electromagnetic Interference
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EMS	Environmental Management Systems
ESA	Ecological Support Areas
GA	General Authorisation
GDP	Gross Domestic Product
GPS	Global Positioning System
HIA	Heritage Impact Assessment
IAIAsa	International Association for Impact Assessment South Africa
IDP	Integrated Development Plan
IPAP	Industrial Policy Action Plan
IPP	Independent Power Producers
IRP	Integrated Resource Plan
LED	Local Economic Development
LM	Local Municipality
MTS	Main Transmission Substation
NBKB	Ngwao Boswa Kapa Bokone (Northern Cape Provincial Heritage Resources Authority)
NCNCA	Northern Cape Nature Conservation Act (No. 9 of 1009)

NCR	Noise Control Regulations (GN R154 of 10 January 1992)
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (Act 25 of 1999)
NWA	National Water Act (No 36 of 1998)
OHL	Overhead Line
O&M	Operational and Maintenance
PPP	Public Participation Process
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SKA	Square Kilometre Array
TB	Tuberculosis
ToR	Terms of Reference
WEF	Wind Energy Facility
WULA	Water Use License Application
WWF	World Wildlife Fund

UNITS OF MEASUREMENT

dB	Decibels
ha	Hectares
kℓ	Kilolitre
km	Kilometre
kV	Kilovolt
GW	Gigawatt
m	Metres
mm	Milimetres
MW	Megawatts

NWA	National Water Act (No 36 of 1998)
OHL	Overhead Line
O&M	Operational and Maintenance
PPP	Public Participation Process
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SKA	Square Kilometre Array
TB	Tuberculosis
ToR	Terms of Reference
WEF	Wind Energy Facility
WULA	Water Use License Application
WWF	World Wildlife Fund

UNITS OF MEASUREMENT

dB	Decibels
ha	Hectares
kℓ	Kilolitre
km	Kilometre
kV	Kilovolt
GW	Gigawatt
m	Metres
mm	Milimetres
MW	Megawatts

Protection of Personal Information Act (POPIA), Act No. 4 of 2013.

Zutari and Business Venture Investments No. 2105 places a high premium on the privacy & personal information of our stakeholders. The processing of personal information is subject to the Protection of Personal Information Act (POPIA), Act No. 4 of 2013.

As a responsible party, Zutari is entrusted with the personal information of many stakeholders such as yourself, potential clients, staff and service providers and we are therefore obligated to process this information in line with the law.

POPIA came into effect on the 1st of July 2021, and we would like to make sure that you are happy to continue receiving communications from us.

Please note that the following, as a Registered I&AP, you will be subject to the following conditions:

- As per the requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, your personal details including your name, contact details and address will be entered into a register and appended to the Environmental Impact Report (EIR) that will be submitted to the Competent Authority (Department: Forestry, Fisheries and the Environment [DFFE]). Any comments received, including responses to such comments and records of meetings, will be recorded and attached in the EIR. The EIR will be made available to members of the public as well as various authorities for review and decision making. As such the following measures have been implemented to adhere to the requirements of both the EIA Regulations, 2014 as amended and POPIA, 2013 as amended:
    - Personal Information of POTENTIAL I&APs will be omitted from the reports and plans made available in the public domain and will only be submitted to the Competent Authority.
    - Personal Information of REGISTERED I&APs will be included in the reports and plans as per the requirements of the EIA Regulations, 2014 as amended. As a Registered I&AP your personal details such as your name, contact details and address may, on written request to the EAP / project contact person, be omitted from the EIR provided in the public domain.
    - Any comments / views / opinions received, including responses to such comments and records of meetings, will be recorded, and attached in the EIR made available in the public domain.
    - Any personal information obtained from the public domain will be included in the plans and reports.

If you would like to keep receiving our communications, then you do not need to take any action at all. If you would like to stop receiving communications, please let us know.

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

The Proponent, *Business Venture Investments No. 2105 (Pty) Ltd (BVI)*, proposes to construct a 300MW Wind Energy Facility (WEF), known as the **Kokerboom 3 WEF**, and associated infrastructure on adjacent farms near Loeriesfontein in the Northern Cape. The proposed Kokerboom 3 WEF would have a maximum generation capacity of up to 300 MW. This WEF will be located adjacent to the authorised Kokerboom 1 ([1]DEA ref. no.: 14/12/16/3/3/2/985) and Kokerboom 2 (DEA ref.no.:14/12/16/3/3/2/986) Wind Farms.

The proponent obtained environmental authorisation for the construction of the Kokerboom 3 Wind Energy Facility on 2 February 2018 (Ref: 14/12/16/3/3/2/1009), on the subject properties. The project is located approximately 50 km north of Loeriesfontein in the Northern Cape Province, directly north and west of the operational Khobab & Loeriesfontein Wind Farms respectively. Subsequently, it has been determined that the wake interactions between Kokerboom 3 and the operational Khobab Wind Farm and Loeriesfontein Wind Farm will be more impactful than previously predicted during the original Kokerboom 3 EIA (when the Khobab & Loeriesfontein WEFs were not yet operational). As a result, the owner of the Kokerboom 3 project wishes to revise the wind farm layout to relocate turbines further northwards away from the operational wind farms, and at the same time split the wind farm project into two separate wind farms, namely the **Kokerboom 3** and Kokerboom 4 Wind Farms. Because it is proposed to relocate turbines outside of the area assessed in the original Kokerboom 3 EIA, the proponent was advised by the Department during a pre-application meeting on 14 July 2020 that a new Scoping & EIR process should be undertaken for the “new” Kokerboom 3 and Kokerboom 4 projects.

Zutari (Pty) Ltd (formerly Aurecon South Africa (Pty) Ltd) has been appointed to undertake the requisite environmental impact assessment (EIA) process for the “new/revised” Kokerboom 3, as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of the Proponent.

This Draft Environmental Impact Assessment Report (EIR) specifically relates to the **Kokerboom 3 Wind Farm.** A separate Draft EIR is being submitted for the proposed Kokerboom 4 WEF.

Note that the environmental authorisation for the revised Kokerboom 3 WEF (if granted), will supersede and replace the existing environmental authorisation for Kokerboom 3 (i.e. the end result will be a single authorisation for a single “Kokerboom 3” WEF on the properties)

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. Four 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 (Figure 1-1).The Kokerboom 3 Wind Farm footprint is approximately 175.6ha (temporary) and 168.2ha (permanent) and will be located on the farms listed in Table 1-1 below, and as illustrated in Figure 1-1 (Refer also to Annexure I for the locality map).

[1] DEA has had a name change to DFFE effective 1 April 2021.

Table 1-1 | Farm details for Kokerboom 3 Wind Farm

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
Gert Johannes Lombard	1/214	C01500000000021400001	Karree Doorn Pan (Portion 1)	5,094.23
TR2 Immobilien GmbH	2/214	C01500000000021400002	Karree Doorn Pan (Portion 2)	5,094.24
Gert Johannes Lombard	RE/213	C01500000000021300000	Remainder of Aan de Karree Doorn Pan No 213	2,580 ha

The wind energy facility will be connecting to the Helios Main Transmission Substation by means of a 132 kV line (DFFE Ref. No.:14/12/16/3/3/1/1818, granted EA on 01 February 2018). This would feed into the existing national electricity grid at the Eskom Helios Main Transmission Substation located south-east of the site.

Additional ancillary infrastructure would include underground cabling between project components, onsite substation/s, foundations to support turbine towers, hardstands to support cranes at each turbine, and permanent operations/maintenance buildings, office and workshop areas.

Service and access roads will be constructed in addition to upgrading existing roads, with the relevant stormwater infrastructure and gates constructed as required. The total length of all access and internal site roads will equate to approximately 95km that will be developed as part of the wind energy facility. This includes all roads required to access the turbines and Facility substation, O&M and BESS complex, as well as access roads directly off adjacent public roads onto the site, and an ~11.5km access road off the Granaatboskolk (Nuwepos Road) over Farm RE/213, 1/214 and 2/214 to the project site.

The property of the proposed WEF may be enclosed with suitable fencing erected along the perimeter, if required. One or more formal laydown areas for the construction period, containing temporary site offices, storage & workshop areas, batching plant along with a guard cabin, will be established. These have been further explained in Chapter 4.

The layout presented and assessed in this report has been subject to detailed specialist walkthroughs and the necessary layout adjustments and micro-siting have been undertaken to adhere to all specialist recommendations. The layout is thus presented for approval together with the granting of environmental authorisation (if granted).

The National Department of Forestry, Fisheries and the Environment (DFFE) has indicated that each of the two proposed Kokerboom WEFs (Kokerboom 3 and 4) must be subject to its own EIA process and that separate EIA reports must be submitted to the competent authority for consideration. This report relates specifically to the **Kokerboom 3 WEF.**

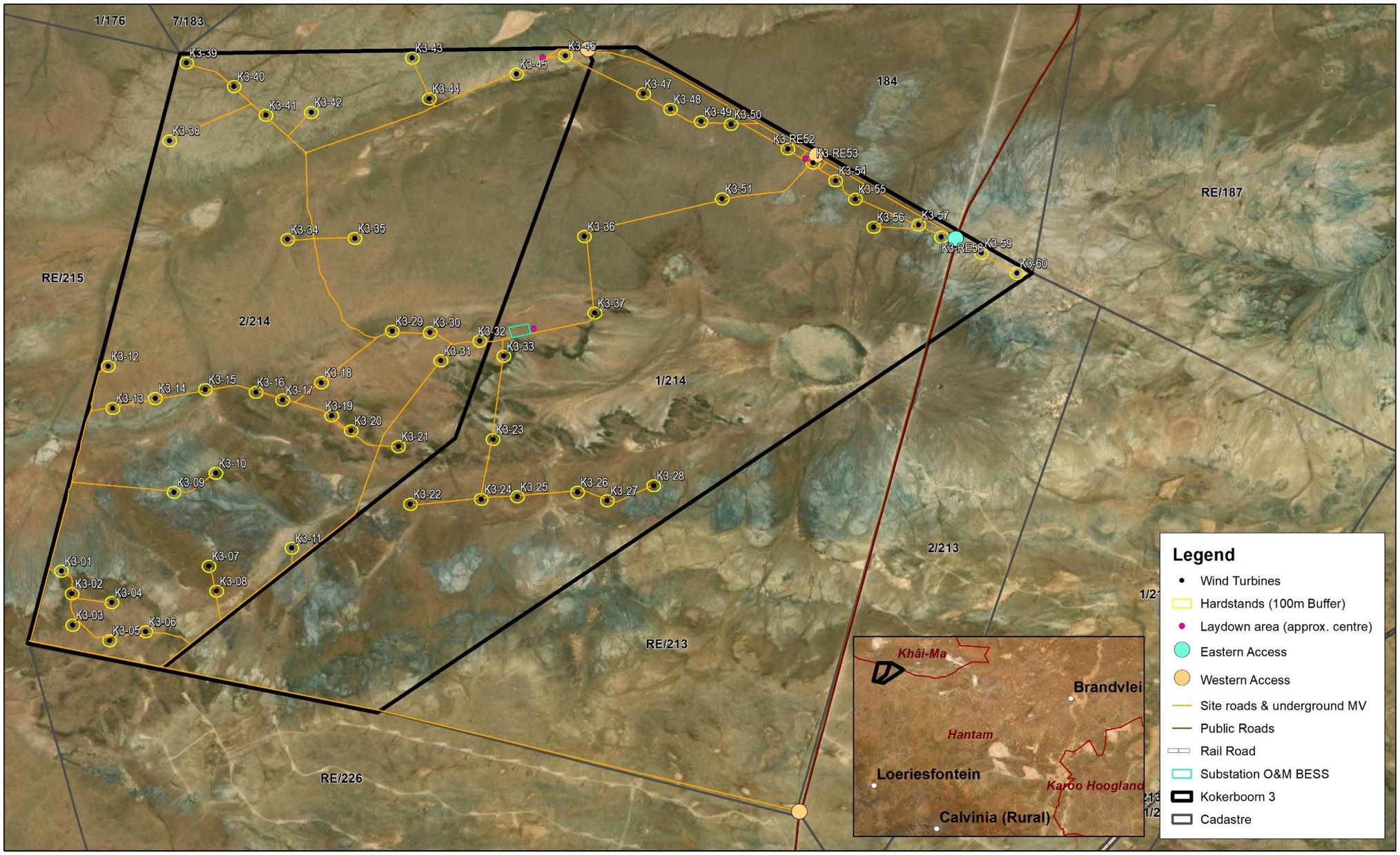


Figure 1-1 | Location of the farm portions for the proposed Kokerboom 3 Wind Farm near Loeriesfontein in the Northern Cape.

1.2 Role players

1.2.1 Applicant

The Proponent or Applicant "*means a person intending to submit an application for environmental authorisation and is referred to an applicant once such application for environmental authorisation has been submitted*".

Business Venture Investments No. 2105 (Pty) Ltd (BVI) is the project proponent and applicant for the proposed project.

BVI are not the owner of the properties to which the applications relate and thus, in accordance with Regulation 39(1) of the EIA regulations, consent letters have been obtained from the landowners and were appended to the Application Form.

1.2.2 Competent Authority

A competent authority, "*in respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing an environmental authorisation in respect of that activity"*.

Contact details for the competent authority is listed below in Table 1-2.

Table 1-2 | Competent authority

Name:	**The National Department Forestry, Fisheries and the Environmental (DFFE): Integrated Environmental Authorisations**
Contact:	Muhammad Essop
Case Officer:	Thando Booi
Postal Address:	Private Bag X447, Pretoria, 0001
Physical Address:	473 Steve Biko Road, Arcadia Pretoria, 0001
Telephone Number:	012 399 9406
Fax Number:	012 359 3625
Email Address:	MEssop@environment.gov.za TBooi@environment.gov.za

1.2.3 Project team and specialists

Zutari has selected a team of highly experienced specialists and multi-disciplinary practitioners in order to execute this project in a professional and unbiased manner. Please refer to Table 1-3 for a list of the team.

Table 1-3 | EIA Project Team

Role	**Consultant**	**Company**
EIA and Project Management		
Project Director	Stephan van den Berg	Zutari
Project Leader / Manager	Charles Norman	Zutari
Project Staff & Senior EAP	Corlie Steyn	Zutari
Sub-consulting Specialists		
Avifauna (birds)	Chris van Rooyen	Chris van Rooyen consulting CC

Role	Consultant	Company
Bats	Stephanie Dippenaar	Stephanie Dippenaar Consulting and Werner Marais from Animalia Consultants
Terrestrial Ecology	Brian Colloty	EnviroSci (Inc)
Aquatic ecology	Brian Colloty	EnviroSci (Inc)
Socio-economic	Tony Barbour	Private Consultant
Agricultural potential	Johann Lanz	Private Consultant
Noise	Morné de Jager	Enviro Acoustic Resources (EAR)
Heritage (incl. archaeology)	Jayson Orton	ASHA Consulting (Pty) Ltd
Palaeontology	John Almond	Natura Viva
Visual and Flicker	Stephen Stead	Visual Resources Management (VRM) Africa
Traffic management plan	Hermanus Steyn	Zutari South Africa (Pty) Ltd
EMI/RFI Assessment	Callie Fouche	ITC Services
Independent transport specialist peer review	Athol Schwarz	Consolidated Civil Engineering Solutions
Butterfly specialist	David Alan Edge	Private consultant
CAA	Yolandi Foord	Zutari South Africa (Pty) Ltd
Defence	EAP (Charles Norman)	Zutari South Africa (Pty) Ltd
Geotechnical study	Steven Seymour and Salona Naidoo	Zutari South Africa (Pty) Ltd

1.2.4 Expertise of the Environmental Assessment Practitioners (EAPs)

The expertise of the Environmental Assessment Practitioners (EAPs) involved in managing the EIA process and compiling this report are summarised in Table 1-4 below. Refer to Annexure A for the full CVs of the EAPs.

Table 1-4 | 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	– Environmental Impact assessment (EIA) – Basic Assessment Reports – Environmental and socio-economic impact assessment (ESIA) – Environmental pre-feasibility and scoping studies – Section 24G Rectification Processes – Environmental Management Programmes (EMPr) – Environmental Control Officer (ECO) – Public Participation Processes – Maintenance Management Plans – Environmental and Social Due Diligence	– Environmental Impact assessment (EIA) – Basic Assessment Reports – Environmental and socio-economic impact assessment (ESIA) – Environmental pre-feasibility and scoping studies – Section 24G Rectification Processes – Environmental Management Programmes (EMPr) – Public Participation Processes – Maintenance Management Plans
Industries of experience	– Energy – wind, PV, hydro & coal – Desalination – Mining – Services Infrastructure Delivery – Municipal Housing – Dangerous Goods Storage	– Hydro & Coal – Mining – Services Infrastructure Delivery – Water Storage – Municipal Housing – Waste

EAP	Charles Norman	Corlie Steyn
	– Water Storage – Industrial Decommissioning – Transport – rail & road – Environmental Rehabilitation – Environmental Auditing and Monitoring	– Environmental Auditing and Monitoring – Borrow Pits – Transport - Road – Environmental Rehabilitation - Wetlands
Countries of experience	– South Africa – Australia – Mozambique – Namibia – Tanzania – Uganda – Kenya – Zambia – Mauritius	– South Africa – Zambia – DRC – Malawi – UAE – Australia
Memberships	Member of the South African affiliate of the International Association of Impact Assessment (IAIA).	– 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).

1.2.5 Independence of the EAP and sub-consultants

The amended 2014 EIA Regulations pursuant to NEMA, provide general requirements for EAPs and specialists with the intention of reducing the potential for bias in the environmental process. The first requirement is that the EAP should be independent (Regulation 13(1)(a) of GN R982, as amended).

Neither Zutari nor any of its sub-consultants are subsidiaries of *BVI*, nor is *BVI* a subsidiary to Zutari.

Zutari and its sub-consultants do not have any interests in secondary or downstream developments that may arise out of the authorisation of the proposed project

Refer to Annexure A for the signed declaration of interest of the EAP. Zutari's environmental management systems (EMS) policy provides a quality management system which includes a number of tiers with various responsibilities for each job grade level based on experience in the environmental field. This requires environmental practitioners to prepare reports and gain experience whilst being guided by a senior colleague. The principal consultant would therefore act as a project leader, managing the EIA process, reviewing the reports and signing off on the requisite reports. This would include signing the declarations and taking responsibility for the EIA process. The details of the EAP are therefore provided for Mr Charles Norman.

In addition to the EIA process, Zutari has provided a renewable engineering team to design a transport team who have provided a transport assessment. In terms of NEMA (Regulation 13(1)(a) of GN R982, as amended), the EAP and in-house specialist are not considered independent. To account for this, an independent EAP and independent transport engineer have been appointed to undertake peer review assessments in terms of Section 13(2) of NEMA.

For this reason, the Transport Assessment was peer reviewed by Mr Athol Schwarz (Consolidated Civil Engineering Solutions) prior to being circulated for public participation. The peer review report is included in Annexure E.

1.3 Why Wind Energy in South Africa

The advent of steam power and the first industrial revolution saw mankind's productivity explode into the 18th and 19th centuries with an uptick in per capita income and rampant population growth. The second industrial revolution followed in the late 19th century and early 20th century, where mass production, electricity and other forms of power ushered in the modern era and saw further growth and expansion in population, productivity and footprint, as mankind spread to every corner of the earth. Since the first industrial revolution, man has been clearing forests and other natural areas and burning renewable and non-renewable fossil fuels in increasing volumes to power our factories, create electricity, power motor vehicles and a variety of other processes. The combustion of fuels (renewable and non-renewable alike) has resulted in a steady release of "extra" Carbon Dioxide (CO_2) gas into the atmosphere, creating a small but continual imbalance in the carbon cycle, and causing atmospheric CO_2 levels to steadily rise above the 'natural' levels. As industry and the human population grew so did the consumption of fuel and the CO_2 emissions. This relationship is shown in the following graph in Figure 1-2.

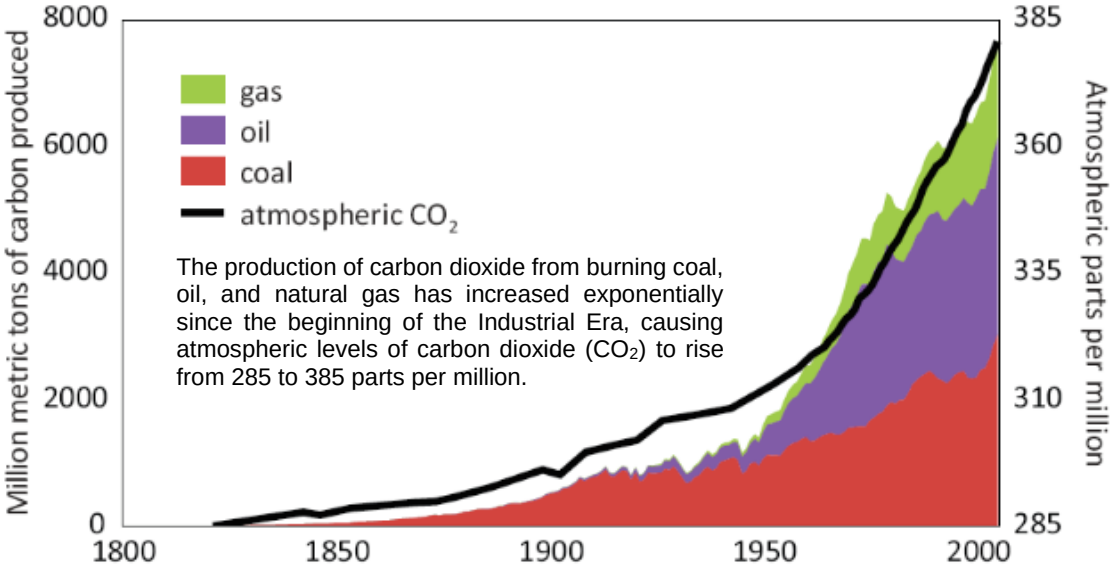


Figure 1-2 | Fossil fuel consumption vs atmospheric CO2 levels (Atmosresearch.com, 2019)

In 1896 a Swedish scientist by the name Svante Arrhenius (Enzler, 2019), was undertaking research in the correlation between CO2 and the great ice ages. He hypothesised a link between infrared radiation from the sun, water vapor and CO2 concentrations and global temperatures. A natural process now commonly known as the "greenhouse effect", which plays an important role in regulating global atmospheric temperatures. Based on this, he (and Thomas Chamberlin) then went on to hypothesise that burning fossil fuels could eventually lead to planetary warming and offered a hypothesis that a doubling of atmospheric CO2 concentrations would result in a 5°C change in average global temperature. This finding was more of a side note and not of grave concern at the time but did become so later and the hypothesis was finally proved one hundred years later in 1987.

In the 1930s a British engineer by the name Guy Stewart Callendar noted that the United States and North Atlantic region had warmed significantly on the heels of the Industrial Revolution (History.com Editors, 2017) and attributed this directly with CO2 emissions. He made repeated warnings to the scientific community between the 30s and 60s that a greenhouse-effect warming of the planet was underway and posed a significant risk. While his claims were met with scepticism in mainstream science, they did precipitate the setting up of the first bespoke CO2 monitoring stations, including a station at the Scripps Institution of Oceanography at the Mona Loa Observatory in Hawaii. Data from this monitoring station led to what is now referred to as the "Keeling Curve", a dataset that confirmed Stewart's concerns, namely the upward rise in CO2 atmospheric levels. This fuelled new research into CO2 and the potential implications for global climate systems.

Between the 60s and 70s consensus started to grow among scientists that the increasing atmospheric CO2 levels (and other industrial pollutants) were in fact responsible for observed increases in global temperatures. However, concerns were temporarily moderated by a "global cooling" theory that gained traction in this period, supported by a short-term cooling trend in the data between the 40s and 70s. However, the 80s saw a sharp increase in global temperatures and 1988 was a critical turning point in the USA with the hottest temperatures on record accompanied by widespread drought and wildfires. Scientists sounded the alarm and brought the issue into the mainstream / public domain. They confirmed that data supported the hypothesis that manmade CO2 emissions were changing average global temperatures, and such could lead to dangerous "climate change". This led directly to the formation of the International Panel on Climate Change (IPCC) in 1988 under the United Nations, a conglomeration of global climate scientists (along with scientists from other fields) which had the objective to collaboratively study and understand climate change and work to "stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system". The IPCC published its first report in 1990, confirming that climate change was taking place, was linked with "excess" human greenhouse gas emissions and would likely result in a warming effect of 0.3°C per decade in the 21st century unless interventions were made.

The 1997 Kyoto protocol identified six gasses and sought agreement amongst member states to actively reduce emission of these "greenhouse gasses" (GHG) with a view to reducing dangerous impacts to the global climate systems. Most of the 194 UN member states, including South Africa, signed the agreement and committed to reducing greenhouse gas emissions and most of the onus placed on the 37 most developed countries (Annex 1 countries). Well-intentioned but not compelling or far reaching enough, the Kyoto protocol has not led to the depth of change and reform needed to steer humanity away from dangerous climate change.

The IPCC's fourth report that was published in 2007 confirmed, unequivocally, that global warming was occurring due to human activities, and this would result in a likely 3°C plus change before 2100 and significant changes to climate, leading to massive ice melt and sea-level rise, extreme weather events, large-scale drought, conflict, famine, heat stress, mass migrations, species die-off, loss of entire ecosystems, loss of habitable and arable land, and driving an estimated 100 Million people into poverty, among other potentially significant impacts at a rate that outpaces the natural, managed and human systems' ability to adapt to these changes. However, many of these impacts could be reduced, delayed or avoided if greenhouse gas emissions are controlled. The IPCC later went on to determine that mankind could limit global warming to 1.5°C to 2°C above pre-industrial levels we could avoid most of the potentially significant impacts.

In 2015 the 11th session of the meeting of Parties (COP11) to the Kyoto Protocol resulted in the Paris Agreement in which 196 parties negotiated new targets and 187 nations, including South Africa, signed the agreement. The Paris Agreement aims to manage the increase in global average temperature to 1.5°C ideally (or well below 2°C maximum by 2100) above pre-industrial levels, recognizing that this would substantially reduce the risks and impacts of climate change. While the world recognises the significance of the impacts associated with global warming and climate change, it has been slow to implement the necessary changes. According to the IPCC, keeping the global warming below 1.5°C would require significant and rapid reductions in global emissions and unprecedented changes in all aspects of society (particularly in developed nations). As the developing countries catch up, global CO2 emission per capita has only increased and is likely to continue with this trend for some time, so the world looks to the developed nations to lead the charge against global warming.

Against this background, South Africa's electricity sector is based largely on old and "dirty" (emission intensive) coal-fired power, which makes South Africa the world's 14th largest emitter of greenhouse gases (GHGs) (Timperley & McSweeney, 2018) and the second highest CO2 emitter per capita, behind Russia (which is a cold climate country), when compared with the BRICS countries (Our World in Data, 2017). Eskom currently relies on fossil-fuels to produce approximately 86.97% (World Atlas, 2016) of the country's electricity, using over 90 million tonnes of coal per annum (Eskom, Understanding Electricity, 2019). Many of South Africa's coal fired power stations are approaching end-of-life and will soon need be decommissioned and the capacity replaced. Despite South Africa's high per capita CO2 levels, the country also suffers with a high level of extreme poverty, inequality and underdevelopment and is in desperate need for further economic development and upliftment.

South Africa is strikingly revealed as a global outlier in this regard in the following per capita emissions vs poverty graph in Figure 1-3.

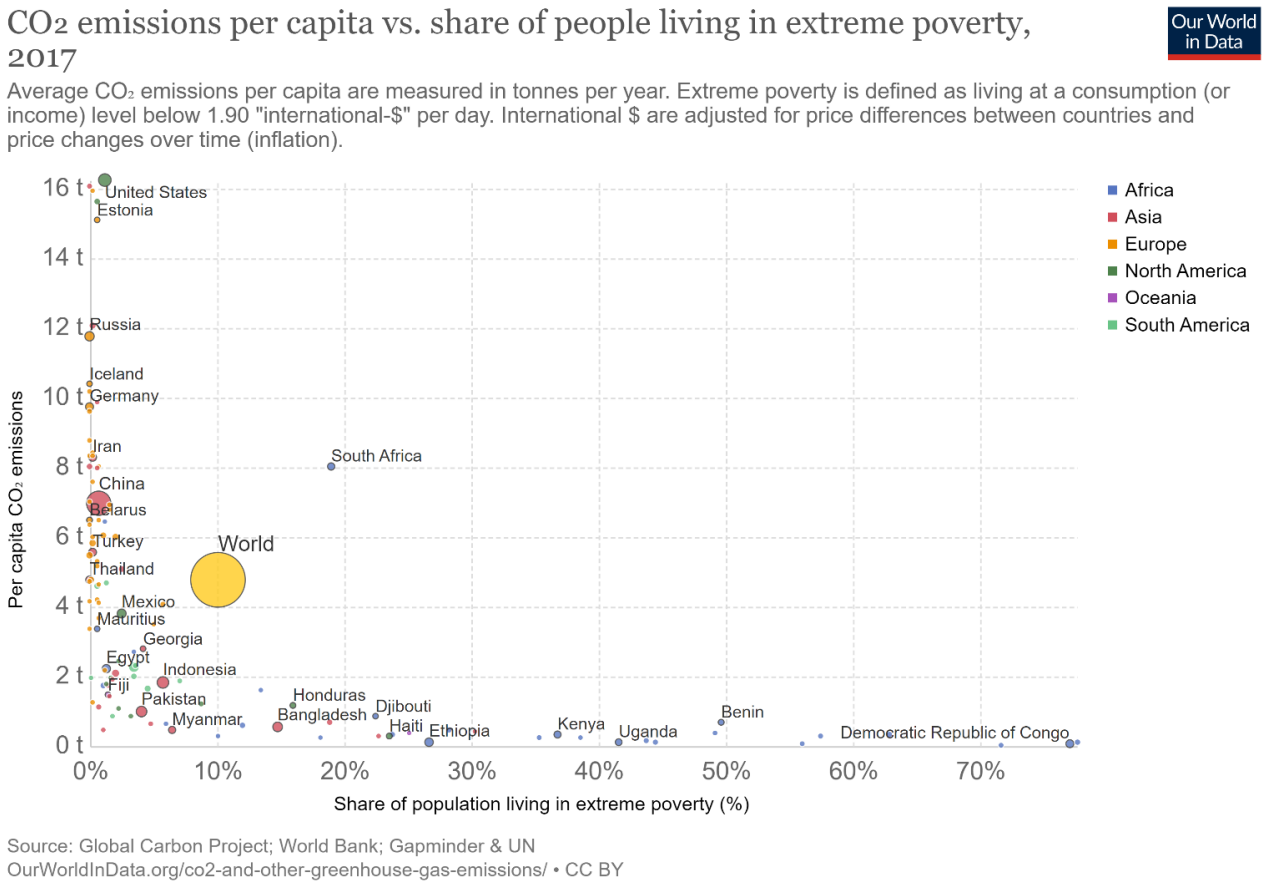


Figure 1-3 | Per capita CO2 emissions vs extreme poverty (Ritchie & Roser, 2017).

South Africa has a major challenge. It has a clear need to continue to develop the country on socioeconomic grounds and lift people out of poverty, which requires more energy, but absolute imperative to curb its high CO2 per capita emissions rates. Added to this is that South Africa's energy supply is currently highly constrained, it has a growing population that is increasing demand through ongoing electrification programmes leading to an oversubscribed power supply and the sporadic need for load shedding. This harms the country's economy, discourages investment and furthers the countries coal burning addiction. New generation capacity is urgently needed to bridge the current shortfall in the short term. It is hard to motivate for any other form of generation other than renewables that can quickly, and cost effectively fill this gap while meeting our CO2 emission commitment. This because it only takes two years or less from construction to operation for winds farms and the lowest cost of energy for a wind farm in the last REIPPPP round (round 4) in South Africa came in at under 60c/ kwh. Subsequent rounds of REIPPPP are expected to achieve even more competitive tariffs. Nuclear is another low carbon option of producing electricity but it has very long lead times, and at present would take the form of a large-scale project which would have significant lead times, upfront costs and related debt burden for the government (a plethora of economic considerations) and is thus is not a quick or short to medium term solution. This is recognised in the government's latest 2019 Integrated Resource Plan (IRP2019), as detailed below, which has more wind energy planned between now and 2030 than any other energy source and no nuclear (except extension of the design life of Koeberg) up to the 2030 horizon. In the longer term (beyond 2030), the coal power stations will need to be replaced with low carbon options, which will likely continue to include renewables, but also nuclear (as baseload), gas and diesel. Eskom recognises that "it is crucial that the private sector plays a role in addressing the future electricity needs of the country. This will reduce the funding burden on Government, relieve the borrowing requirements of Eskom and introduce generation technologies

that Eskom may not consider part of its core function" (Eskom, Guide to Independent Power Producer (IPP) processes, 2019).

For these reasons South Africa has turned to renewable energy over conventional fossil fuel-based energy generation. Nuclear and renewable energy, including wind, solar, hydro and biogas, provide a lower impact alternative to the conventional electricity generation methods, as far as the global warming crisis is concerned, and can also contribute to a range of socioeconomic benefits which contribute to the country's economic development imperatives.

The government began exploring feed-in tariffs (FITs) for renewable energy in 2009 but according to the PPIAF and World Bank Group Report on 'South Africa's Renewable Energy IPP Procurement Program' (PPIAF, 2014), these were later rejected in favour of competitive tenders for commercial scale projects. The resulting program, now known as the REIPPPP, has successfully channelled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices. Thus far the REIPPPP, in line with the Integrated Resource Plan (IRP2010) have procured 6,422MW of new renewable power from 112 Independent Power Producers (IPPs) and installed just over 3,776 MW of it (SAWEA, 2019). The REIPPPP's contribution to South Africa's climate change objectives so far is a reduction of 33.2 million tonnes or CO2 (by 31 December 2018) (SAWEA, 2019) and these reductions will continue to grow as the programme roles out. The renewable energy sector is estimated to be more employment-intensive than traditional thermal powerplants and has attracted R 209.4 billion in private sector investment (SAWEA, 2019). Additionally, renewable energy facilities (wind and solar) have been getting cheaper as the global market develops and is now cheaper in R/kWh than conventional power supplies (Coal and nuclear), as shown in research undertaken by the CSIR back in 2016 (wind and solar has become even cheaper since then) and presented in the following graph in Figure 1-4.

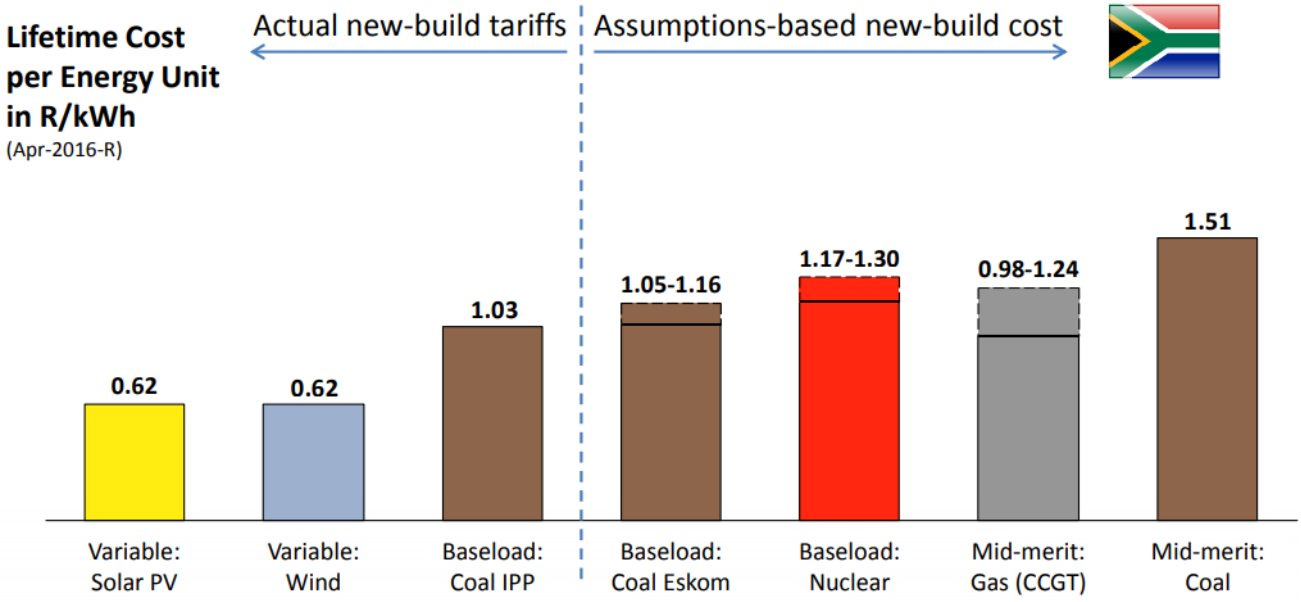


Figure 1-4 | Power cost per kWh for the main generation types under consideration by South Africa (CSIR, 2016)

The drawback, however, is that solar and wind energy are not consistent baseload power producers because the sun does not always shine (night times, cloud cover or even seasonal change) and the wind does not always blow consistently or predictably. These facilities therefore produce intermittent and variable power and often not at the times when its most needed, i.e. the daily electrical demand peaks around sunup and sundown. These problems can be mitigated, firstly through storage (either in chemical batteries, thermal reservoirs, pump storage schemes, or other mechanisms) to level variations or bridge short periods and secondly by spreading out the renewable facilities across the country to ensure some facilities are always located somewhere where energy can be produced (i.e. the wind is blowing and/ or the sun is shining). Wind energy is better placed than solar to provide electricity during the daily 6-8a.m and 6-9p.m peaks in energy demand and this is the main reason that

in the 2019 Integrated Resource Plan (2019) (IRP2019) there is far more new wind energy planned till 2030 than solar. Lastly one must make up the difference with peaking facilities (i.e. quick response gas and diesel turbines that can fill the demand/supply gaps). Despite all this, the country may still need additional baseload capacity in the form of new coal or nuclear beyond 2030 and 2040.

The 2010 Intergraded Resource Plan (IRP2010) for electricity set a target to source 17.8 Gigawatts (GW) of the country's electricity supply from renewable energy sources, over a 20-year period from 2010 to 2030 (Independent Power Producers Office, n.d.). The 2019 Integrated Resource Plan (2019) (IRP2019) was released on 18 October 2019 and includes the following capacity allocation.

- 1 500MW of new coal power (noting that there will be decommissioning of coal capacity over the period)
- 2 500MW of hydro power
- 6 000MW solar
- 14 400MW wind
- 2 000MW of storage
- 3 000MW from gas

The following chart (Figure 1-5) provides a view for South Africa's energy mix between now and 2030. The Department of Energy (DoE) indicated that new nuclear capacity may come online after 2030 to replace decommissioned coal baseload and shows the central role that wind energy will play in this transformation. Wind is by far the largest planned source of new energy capacity over the next 10 years which shows that there is a strategic imperative by government for wind power and need to develop wind farms at diverse locations across the country.

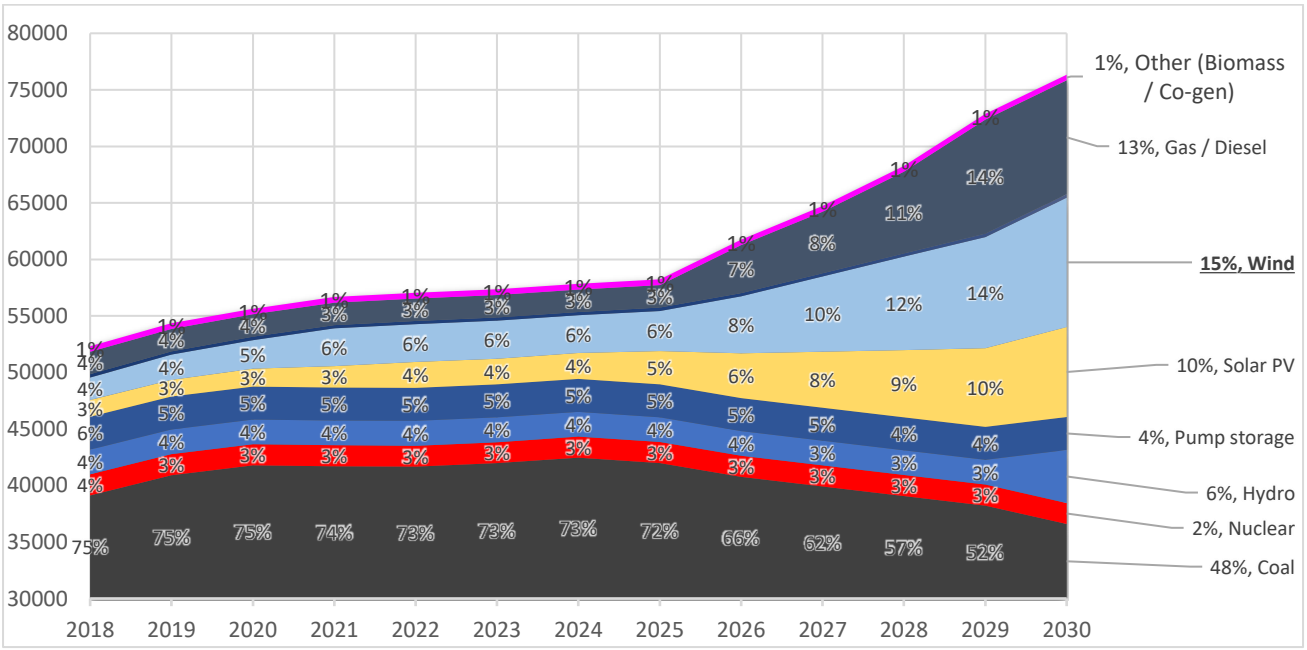


Figure 1-5 | South Africa's energy mix from 2018 to 2030 based on IRP2019 figures (Integrated Resource Plan 2019, 2019)

Kokerboom 3 Wind Farm would, if authorised and selected as a preferred bidder, form part of the REIPPPP and contribute to the IRP 2019 targets for wind energy and much needed low carbon energy to the national grid to assist South Africa with its development objectives, a transition to a low carbon economy and its commitments to combat climate change.

Wind energy is therefore of critical and strategic importance to South Africa's in terms of its future energy mix (particularly in the short term), economic development objectives, but also in the challenge to manage emissions

and global warming related climate change and the variety of potentially catastrophic global impacts associated with this.

1.4 Structure of the EIR

The purpose of this EIR[2] is to present the project within its current context, describe the process and outcome of how the most suitable location and layout was identified and present the assessment of the impacts and the respective mitigation measures. Accordingly, the EIR includes the following chapters:

- Chapter 1 introduces the Kokerboom WEF project and the EIA project team.
- Chapter 2 provides the legal and policy framework relevant to the project.
- Chapter 3 focuses on the EIA approach and methodology, summarising the phases of the EIA, the public participation process, as well as any assumptions, limitations and gaps of the study.
- Chapter 4 describes the approach to the alternatives assessment.
- Chapter 5 provides a project description specific to the Kokerboom 3 Wind Farm.
- Chapter 6 describes and assesses each environmental impact. The impact assessments are largely drawn from the specialist studies (Annexure D) and mitigation measures are provided.
- Chapter 7 provides a cumulative assessment, considering the impacts of the proposed Kokerboom 3 Wind Farm alongside other renewable energy projects in the immediate area.
- Chapter 8 provides a summary of the key findings and conclusions, as well as the way forward. The environmental impact statement of the EAP is also included in this section.
- Chapter 9 provides a list of the references that were used to compile this report.

A number of annexures accompany this report and include the following:

- Annexure A provides details on the EAPs who compiled this report, as well as the EAP declaration.
- Annexure B provides correspondence with DFFE to date. Responses to the comments provided by DFFE on the Scoping Report have been included in Annexure C.
- Annexure C contains the Public Participation documents to date
- Annexure D includes specialist reports that support the findings in this EIR.
- Annexure E provides the peer review report for the reports that have been produced by Zutari.
- Annexure F provides the environmental management programme (EMPr) for the proposed Kokerboom 3 Wind Farm and the Generic EMPr (DFFE)
- Annexure G provides the Amended Application Form and Annexures
- Annexure H provides the corner co-ordinates of the property as well as start middle and end points of all linear activities.

[2] Appendix 3 of EIA Regulation (GN R982, as amended) of NEMA lists the content required in an Environmental Impact Assessment Report. This has been listed for cross checking purposes on the page preceding the table of contents.

2 LEGISLATIVE AND POLICY CONTEXT

The legislative and policy context of the Report was detailed in the Scoping Report and refined in this EIR based on additional information that has become available. The planning context is detailed in Section 5.2 hereafter as part of the 'need and desirability' evaluation.

2.1 Relevant Legislation

An overview of the relevant legislation is provided in Table 2-1 and has been refined since Scoping based on the relevancy to the Project.

Table 2-1 | Legislation considered in preparation of the Draft EIR

Legal Requirements		
Legislation considered	**Relevant Organ of State / Authority**	**Aspect of Project**
National Environmental Management Act, Act No. 107 of 1998 (NEMA), as amended	Department of Forestry, Fisheries, and the Environment (DFFE)	Several listed activities in terms of NEMA GN No R982, R983, R984 and R985 in the Government Gazette of 4 December 2014 (as amended on 7 April 2017), have been triggered and need to be authorised for the proposed wind energy facility (also see Table 2-2). Based on the listed activities triggered, the application for environmental authorisation has followed the Scoping and EIR process as set out in Regulations 21-24 of GN R982.
National Environmental Management: Biodiversity Act, Act No. 10 of 2004	Department of Forestry, Fisheries, and the Environment (DFFE)	The act calls for the management of all biodiversity within South Africa. No Red Data listed species were observed according to the Ecological Assessment 2021, but all indigenous fauna is protected under the NCNCA (refer further below in this table)
Environmental Conservation Act, Act No. 73 of 1989 (ECA)	Department of Forestry, Fisheries, and the Environment (DFFE)	WEFs and related infrastructure will increase noise levels during construction as well as possible operational noises. Noise emitted by WEFs include aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCR) was promulgated. The NCRs were revised under Government Notice Number R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Currently, no provincial or local regulations exist in the Northern Cape and no approval is required. Mitigation measures, recommended by the noise specialist have been included in this Draft EIR and EMPr.
National Water Act, Act No. 36 of 1998 (NWA)	Department of Water Affairs and Sanitation (DWS)	Section 21 of the NWA recognises water uses that require authorisation by DWS before they commence. Construction of infrastructure within drainage lines will be required for the associated roads and underground cables and authorisation is therefore required in terms of Section 21 (c) and (i) in the form of either a General Authorisation or Water Use License Application (WULA). The information required by the DWS for

Legal Requirements		
		this application has been included in the aquatic ecology assessment in Annexure D. The Water Use Authorisation application has been submitted, however the Department of Human Settlements, Water & Sanitation will only process the application if the project is awarded preferred bidder status in terms of the REIPPPP. No water use may begin without the appropriate authorisation.
National Heritage Resources Act, Act No. 25 of 1999 (NHRA)	South African Heritage Resources Agency (SAHRA), and Northern Cape Provincial Heritage Resources Authority Ngwao Boswa Kapa Bokone (NBKB)	The proposed Kokerboom 3 Wind Energy Facility will change the character of the sites and will exceed 5,000 m^2 in extent. The proposed roads will exceed 300 m in length. Section 38 of the NHRA is thus applicable. As such a Heritage Impact Assessment and Palaeontological Assessment have been undertaken as required by the NHRA. Comment on the project has been obtained from NBKB and SAHRA during the Scoping Phase and will again be obtained during the PPP phase for Draft EIR. Any appropriate mitigation measures required will furthermore be included in the Final EIR and EMPr.
Aviation Act, Act No 74 of 1962	Civil Aviation Authority (CAA)	Wind turbine generators can interfere with radio navigation equipment. Turbines can also present potential physical obstacles and may need to be a certain colour (white) or fitted with aviation warning lights as required by the CAA. Comment on the project has been sought from the CAA as part of the public participation process. The CAA has issued a letter of no objection for the project and have confirmed that their final approval will be provided once construction is complete, based on as-built specifications.
Conservation of Agricultural Resources Act, Act No. 43 of 1983 (CARA)	Northern Cape Department of Agriculture and Rural Development	The purpose of this Act is to ensure that natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. As such, as part of the EIA process, recommendations will be made to ensure that measures are implemented to maintain the agricultural production of land, prevent soil erosion, and protect any water bodies and natural vegetation on site. The Proponent together with the relevant farmers should also ensure the control of any undesired aliens, declared weeds, and plant invaders listed in the regulation that may pose a problem as a result of the proposed project.
National Road Traffic Act, Act No. 93 of 1996 (NRTA)	Department of Transport, Northern Cape	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. Due to the large size of many of the facility's components (e.g. tower and blades) they will need to be transported via "abnormal loads". As such, the Northern Cape Department of Transport will be provided with an opportunity to review and comment on this EIA process.
The National Energy Act, Act No. 34 of 2008	Department of Energy (DoE)	One of the requirements for the REIPPPP is for the Applicant to hold an EA for the proposed project. In this regard, an

Legal Requirements		
		application for EA requires a S&EIR process to be undertaken The REIPPPP is guided by the National Energy Act, one of the purposes of which is to promote sustainable development of renewable energy infrastructure.
Northern Cape Nature Conservation Act Act No. 9 of 2009 (NCNCA)	Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform	Numerous sections (specifically sections 50-51) under NCNCA deal with indigenous and protected plants. The protected status of various species that may be located on the site requires a permit under NCNCA in order for the plants to be removed or destroyed i.e. a permit is required before development may commence.
Astronomy Geographic Advantage Act, Act No. 21 of 2007 (AGA), and associated Regulations	Department of Science and Innovation (DSI)	In terms of Schedule D of the Regulations on the Protection of the Karoo Central Astronomy Advantage Areas (GN 1411 of 15 December 2017), wind turbines located more than 50km away from the SKA Infrastructure Territory are exempt from requiring a permit from the DSI unless the operational turbines are found to cause interference with the SKA. The Kokerboom 3 WEF is more than 50km away from the SKA Infrastructure Territory and is thus exempt from the AGA permitting requirements. Regardless, an Electro-magnetic interference (EMI) assessment was undertaken as part of the current EIA process to determine the potential impact on the SKA radio telescope. A comment on the project will also be obtained from SKA, for its inclusion in the EIA process. It is noted that any transmitters that are to be established, or have been established, at the site for the purposes of voice and data communication will be required to comply with the relevant AGA regulations concerning the restriction of use of the radio frequency spectrum that applies in the area concerned.

2.2 National Environmental Management Act (NEMA, No. 107 of 1998, as amended)

The National Environmental Management Act 107 of 1998 (NEMA) provides the framework for environmental decision-making in South Africa and the Environmental Impact Assessment (EIA) Regulations (GN No. R982 of 8 December 2014, as amended on 7 April 2017) serve as the instrument through which development decisions are made. Specifically, for those developments that may trigger certain 'listed activities' identified in GN R983, R984 and R985, as amended, which are considered to have potentially detrimental impacts on the environment. The proposed wind farm development triggers a number of listed activities contained in GN R983, R984 and R985 and therefore prior authorisation to undertake the listed activities must be sought via a Scoping and Environmental Impact Reporting (S&EIR) process. A formal application was submitted to the DFFE as the decision-making authority.

Accordingly, NEMA identifies activities that require authorisation prior to commencement. Such activities listed in the 2014 EIA Regulations (GN R982, as amended) are detailed in Table 2-2.

Table 2-2 | Listed activities triggered by the proposed Kokerboom 3 Wind Farm

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 Activity 14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500cubic metres.	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 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.

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 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.

2.3 National Screening Tool

Government Notice 960, gazetted on 05 July 2019, in accordance with the NEMA EIA Regulations 2014 (as amended) requires that a National web based environmental screening tool is used to produce a report that should be submitted with an EA application to the DEA[3] from 05 October 2019 and onwards (i.e. 90 days following the date of publication of this notice). The downloaded report is appended in Appendix 11 of Annexure G (Amended Application Form). This report shows, on a high level, the site's sensitivity to wind farm development based on different environmental themes (including, inter alia, terrestrial ecology, avifauna, heritage) and identifies assessment protocols that must be undertaken depending on the environmental theme's sensitivity rating within the development site.

Assessment protocols that set out the "*procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the national environmental management act, 1998, when applying for environmental authorisation*" were Gazetted on 20 March 2020. However, the specialists engaged for this study were appointed before the notice was gazetted, specifically on or before 19 February 2020 and as such the protocols do not apply to the current application. The DFFE confirmed in an email (Annexure B.4) dated 7 April 2021 that the onus is on the applicant to prove that the specialist studies for Kokerboom 3 were commissioned prior to the publication of GN 320 of 20 March 2020. Proof of the date of appointment has been provided in Annexure H of the Final Scoping Report (June 2021).

2.4 National Policy Framework Governing Renewable Energy

Several policies have been developed with the aim of diversifying the electricity generation mix for South Africa, these include:

- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- Renewable Energy White Paper (2003); and
- National Climate Change Response Policy White Paper (2011).

Referred to in more detail in Section 1 of this report, the 2019 National Integrated Resource Plan (IRP) (Department of Energy, 2019) sets out to new targets for energy generation from renewable sources. The majority of the additional energy targets set by the IRP will be from renewable sources of which wind energy makes up the bulk. The IRP envisions an additional 14,400 MW of power being produced from wind, 6,000 MW from photovoltaic solar plants, 3,000 MW from gas, 2,500 MW from hydropower and an additional 1,500 MW from coal by 2030. This translates to approximately 15-18% of the country's energy needs being serviced through wind energy by 2030. The renewable energy targets are procured through a competitive tendering process called the REIPPPP run by DoE. The success of this programme has been internationally recognised, with the United Nations Environmental Programme (UNEP) 2014 Report placing South Africa among the top-10 countries in respect to renewable energy investment.

The proposed wind farm development aligns thus with South Africa's national policy direction and contributes to the country being able to meet some of its international climate change obligations e.g. South Africa is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, as well as the recent Convention of the Parties (COP) 21 in Paris 2015, which led to the Paris Agreement which sets the current targets and commitments for the international community with regards climate change.

South Africa's Constitution (1997), together with the three policies mentioned above and indicated in **Figure 2-1** below, have been key in developing South Africa's renewable energy industry.

[3] DEA is now referred to as DFFE effective 1 April 2021.

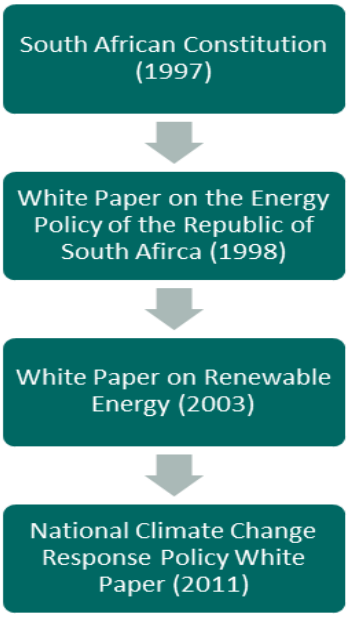


Figure 2-1: Key policies for initiating renewable energy in South Africa

2.5 National, Provincial and Municipal Planning Context

The renewable energy industry has substantial support in the South African planning context, which is detailed in the following national and provincial plans:

- National
    - National Development Plan (NDP) (2030);
    - National Integrated Resource Plan for Electricity (2016);
    - National Integrated Resource Plan for Electricity (2010-2013) and successor, IRP2019.
    - National Infrastructure Plan (2012);
    - The DEA Strategic Environmental Assessment (SEA) for the roll-out of large-scale wind and solar development which identifies strategic Renewable Energy Development Zones (REDZs) Phase 1 (2015) and 2 (2020); and
    - The DEA National Electricity Grid Infrastructure Strategic Environmental Assessment (SEA) which identifies the strategic Transmission Corridors linked with the REDZ (2015).
- Provincial

More specifically, the proposed Kokerboom 3 Wind Farm falls within the jurisdiction of the Hantam Local Municipality and the Namakwa District Municipality. An evaluation of the 'need and desirability' of the project (Section 5.2) considers the strategic context of the project with regard to the municipal Integrated Development Plans (IDPs):

- Namakwa District Municipality IDP 2019-2020.
- Namakwa District Municipality Draft IDP 2020-2021.
- Namakwa District Municipality Budget Process Plan 2021-2022.
- Namakwa District Municipality Local Economic Development (LED) strategy; and
- Hantam Municipality IDP 2020-2021.

2.6 Relevant Guidelines

This EIA process is informed by the series of national Environmental Guidelines where applicable and relevant:

- EIA Guideline for Renewable Energy Projects (DEA, 2015).
- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010).
- IEIM, Information Series 2: Scoping (Department of Environmental Affairs and Tourism (DEAT), 2002).
- IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002).
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002).
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004).
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004).
- IEM Guideline Series 7: Public Participation in the Environmental Impact Assessment Process (DEA, 2012)
- Birds and Wind-Energy Best-Practice Guidelines: Third Edition (BirdLife SA and EWT, 2015).
- Environmental, Health, and Safety Guidelines for Wind Energy (World Bank Group, 2015).
- Good Practice Guidelines for Surveying Bats and Wind Energy Facility Developments – Pre-construction 4th edition (Sowler et al. 2016).

The following guidelines from the Department of Environmental Affairs and Development Planning (Western Cape) (DEA&DP) were also taken into consideration as best-practice, even though the project is situated in the Northern Cape:

- Guideline for involving biodiversity specialists in EIA process (Brownlie. 2005).
- Guideline for involving heritage specialists in the Environmental Impact Report process (June Winter & Baumann, 2005).
- Guideline for involving visual and aesthetic specialists in the Environmental Impact Report process (Oberholzer.2005).
- Guideline for Environmental Management Plans (Lochner, 2005).
- Guideline for determining the scope of specialist involvement in EIA Processes (2005).
- Guideline for the review of specialist input into the EIA Process (June 2005).
- Guideline on Alternatives, EIA Guideline and Information Document Series. (DEA&DP, 2011).
- Guideline on Need and Desirability, EIA Guideline and Information Document Series. (DEA, 2012).
- Guideline on Public Participation, EIA Guideline and Information Document Series. (DEA&DP, 2011)

3 EIA PROCESS

3.1 Approach to the Project

As outlined in Figure 3-1, there are three distinct phases in the EIA process namely the Pre-Application Phase, the Scoping Phase, and the EIR Phase. A description of the activities which have been undertaken during each phase is provided in the following sections, and summarised in

Table 3-2. Note that this report covers the third phase, *viz*. the Environmental Impact Assessment Report Phase.

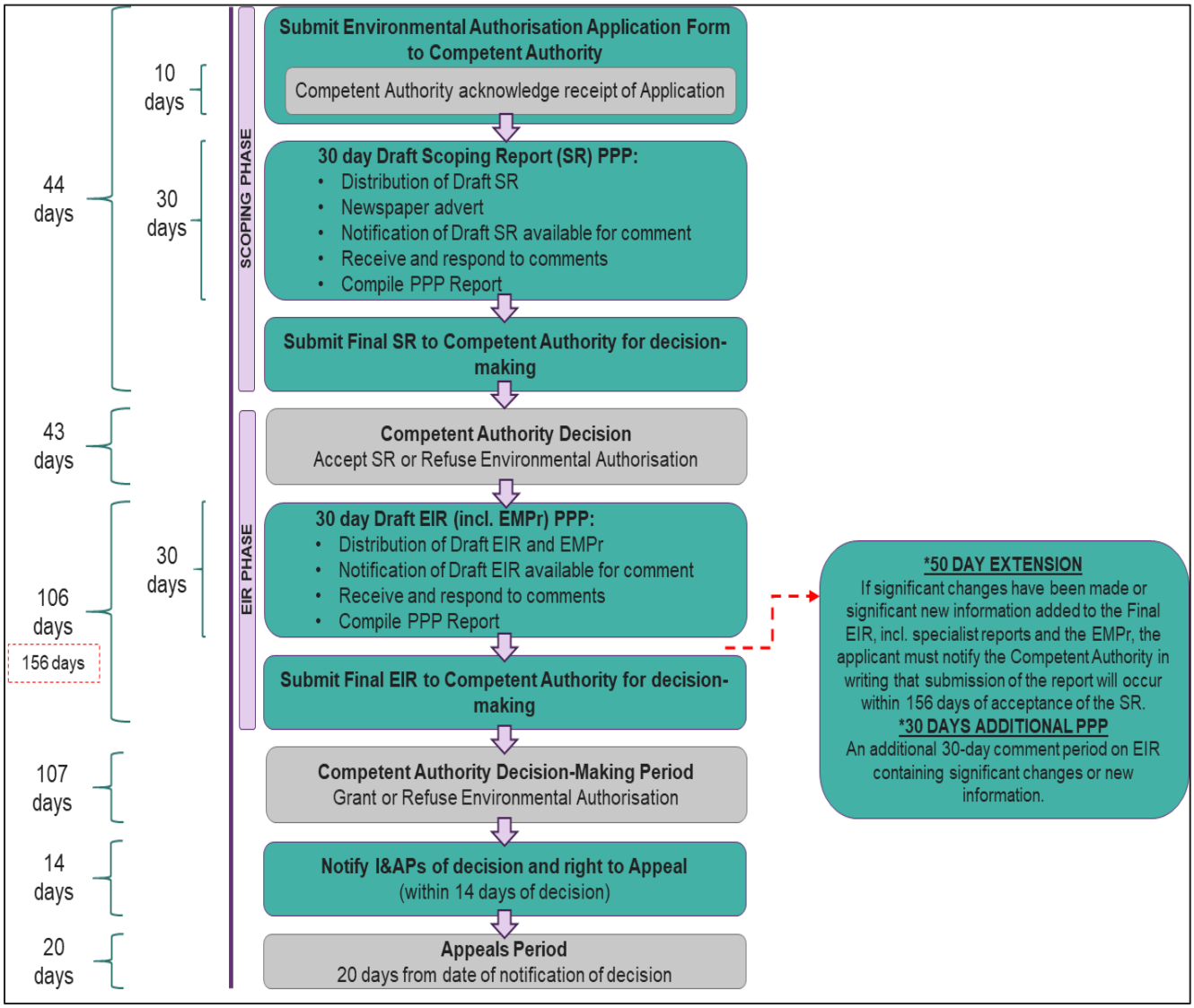


Figure 3-1 | The EIA process in terms of NEMA

As illustrated in Figure 3-1, three stages of public participation are included in the EIA process, at the Pre-Application, Scoping and EIR phase, respectively. More information on the Public Participation Process (PPP) is included below in Section 3.3.

3.1.1 Pre-Application Phase

As detailed in the Scoping Report, the Pre-Application Phase consisted of a pre-application meeting, site visits, and an initial PPP as discussed below in Section 3.3.

The Pre-Application Phase consisted of site visits, pre-application meeting with DFFE and a PP Plan as accepted by DFFE on 29 October 2020.

A site visit was undertaken in April 2021 to familiarise the EAP with the site. The specialists visited the site in February and March 2020 to undertake a site baseline survey and to identify potential areas of concern or opportunity.

A full 12-month bird and bat monitoring study was undertaken over all land parcels that encompass the Kokerboom 3 WEF area. Bat monitoring commenced on 16 August 2019, when static recorders were installed, and monitoring was completed on 5 June 2020. Bird monitoring started in June 2019 (winter) until the end of March 2020 (autumn). The other specialists (listed above in Table 1-3) visited the site in February - May 2020. Initial feedback from specialists was included in the Scoping Report . Detailed specialist impact assessments are now annexed to this Draft EIR.

An application form for the project was submitted to DFFE to register the project on the Department's databases. A reference number was allocated to the project which is used on all correspondence referring to Kokerboom 3 WEF. Following the receipt of the application form, the Final Scoping Report was submitted to the DFFE within 44 days.

The EIA process, in terms of the 2014 EIA regulations (amended on 7 April 2017 under regulation number 326), follows stringent timeframes between each phase. At a pre-application meeting with DFFE, held on 14 July 2020, it was agreed that the application form could be submitted together with the final Scoping Report to ensure that the timeframes for completing the EIA process do not lapse. The minutes of this meeting have been included in Annexure B. A subsequent email from DFFE on 24 March 2021 confirmed that no other pre-application meeting was required. This email is also included in Annexure B.

The Approved PP Plan has been followed (Annexure C).

The COVID-19 Disaster Management Regulations, Directions Annexure 3: Services to be provided or obtained by proponent, applicants, environmental assessment practitioners (EAPs), specialists, professionals undertaking actions as part of the environmental authorisation process and organs of state as commenting authorities required in terms of the National Environmental Management Act, the National Environmental Management: Waste Act, and the Environmental Impact Assessment Regulations, (EIA Regulations) (Annexure 3) have been and will be followed (Annexure B and C).

The Pre-Application Phase therefore includes the compilation of the application form for environmental authorisation, placing of site notices as well as drafting the Scoping Report which has been done.

3.1.2 Scoping Phase

The Scoping Phase commenced with the submission of the application form and draft Scoping Report, undertaken in terms of the requirements listed in Appendix 2 of the 2014 EIA Regulations, on 5 May 2021. Following this, an acknowledgement of receipt of the application and draft Scoping Report (12 May 2021), a comment on the draft Scoping Report (25 May 2021) and an acceptance of the Scoping Report (14 July 2021) were received from the DFFE for the proposed Kokerboom 3 Wind Farm. These letters have all been included in Annexure B.

The aim of the Scoping Phase was to identify preferred project alternatives, scope of the impact assessment and consultation process, within the context of the receiving environment and the nature of the proposed activities. This allowed potential social and environmental aspects to be identified by a team of specialists, by a combination of desktop literature review and spatial analysis, as well as time spent in the field. The potential

impacts on these aspects were assessed at a high level to determine the environmental sensitivity of the site. This then enabled the layout of the proposed Kokerboom 3 Wind Farm and associated infrastructure to avoid environmentally sensitive areas as far as practicable. Where these areas would be unavoidable by the proposed infrastructure, preliminary recommendations and mitigation measures from the specialists have been considered to minimise potential negative impacts, and to enhance potential positive impacts.

As the main deliverable for the Scoping Phase, the Scoping Report was the procedure used for determining the extent of, and approach to, the EIR Phase. It also provided a motivation for environmental aspects that, following a preliminary investigation, could either be scoped out of the EIA process, or would require further assessment in the EIR. Provisional impacts were associated with each of these aspects and where negligible were scoped out of the EIA process.

Further investigation into the impacts of the following key environmental aspects and themes were therefore undertaken during the EIR Phase:

- Terrestrial ecology (flora and fauna but excluding avifauna and bats);
- Bats;
- Avifauna;
- Aquatic ecology;
- Heritage, archaeology;
- Socio-economic aspects;
- Visual landscape;
- Noise;
- EMI;
- Traffic;
- Civil Aviation;
- Defence (Wind) and
- Geotechnical study

Agriculture, Palaeontology and Flicker were investigated during the Scoping Phase. The desktop findings together with recommendations from the appointed specialists found the potential impacts of the Kokerboom 3 Wind Farm to be negligible. No further investigation into these environmental aspects will therefore be required. Final Statements / Reports from the various specialists to confirm this have been included in this Draft EIR in Appendix D. All three specialists considered the final layout for Kokerboom 3.

The draft Scoping Report was circulated for a 30-day public comment period between 7 May 2021 and 7 June 2021. Following this, the report was updated to final and submitted to the DFFE on 14 June 2021. The final Scoping Report was accepted by the DFFE on 14 July 2021.

3.1.3 Information requested from DFFE on Final Scoping Report

The DFFE accepted the Final Scoping Report on 14 July 2021 (Refer Annexure H) and requested the following additional information:

3.1.3.1 Wake loss compensation

Comment from DFFE:

The Department has noted that the applicant is in the process of concluding a wake toss compensation agreement with the owners of Khobab and Loeriesfontein Wind Farms, which occur as a result of the proposed Kokerboom 3 project and that proof of the conclusion of the wake loss compensation agreement will be provided with the draft EIR. However, you are required to provide wake loss risks posed by this development and measures to mitigate those risks.

Wake Effects

Wind turbines function by extracting energy from incoming wind. In doing so, the wind downstream of a wind turbine will be reduced in speed and will be more turbulent than the incoming wind in front of the turbine. This change in wind flow behind the turbine is known as a "wake effect". Due to wake effects, the energy production of wind turbines located downwind of other turbines may be affected since there will be less wind available to the downwind turbines. The increased turbulence of the wind may also impact the optimal functioning of downwind turbines. The loss in energy experienced by downwind turbines, as a result of wake caused by upwind turbines, is known as "wake loss".

As the wind energy industry continues to expand, it is inevitable that more and more wind farms will begin to cluster in areas of good wind resource. As a result, wake interactions between neighbouring wind farms are becoming more and more common – not only in South Africa but globally as well.

The magnitude of the wake effect and associated wake loss is dependent on a number of factors, including:

- Wind speed and wind direction
- Atmospheric conditions
- Distance between turbines (the greater the distance, the lower the wake effect)
- Layout of the turbines
- Number of turbines (the more turbines, the greater the compound wake effect)
- Turbine model and turbine dimensions (larger rotor diameters typically result in greater wake effects)

Wake Loss Risks & Mitigation

The Kokerboom 3 Wind Farm is located immediately north of the existing Khobab Wind Farm and approximately 3km west of the existing Loeriesfontein Wind Farm. The prevailing wind direction is from the south-west to the north-east. The Kokerboom 3 Wind Farm is thus downwind of the operational projects and will be a recipient of wake effect and wake loss from the two operational wind farms. In turn, the Kokerboom 3 Wind Farm may also cause wake loss to the Khobab and Loeriesfontein Wind Farms when the wind deviates from the prevailing direction.

Wake loss risk can be mitigated primarily though:

i. **Layout design**

The existing Kokerboom 3 EA authorizes 60 wind turbines concentrated in the south of the project properties, in very close proximity (i.e. within ~2kms) of the Khobab and Loeriesfontein Wind Farms. Subsequent to the original EIA, it has been determined that the wake interactions between Kokerboom 3 and the operational wind farms will be more impactful than previously predicted during the original Kokerboom 3 EIA (when the Khobab

and Loeriesfontein WEFs were not yet operational). As a result, the owner of the Kokerboom 3 project wishes to revise the wind farm layout to relocate turbines further northwards away from the operational wind farms, which will significantly reduce or remove the wake loss to the existing wind farms. In the current Kokerboom 3 layout, some turbines have been relocated over 11km away from Khobab and Loeriesfontein in order to remove the wake less effect.

The current Kokerboom 3 layout (which is assessed in this EIR) has been developed specifically to reduce wake loss as far as possible, while optimising energy production and avoiding all identified environmentally sensitive areas.

The current layout – and in fact the entire EIA process – has been undertaken to reduce and mitigate wake loss risk to the Khobab and Loeriesfontein Wind Farms. The revised Kokerboom 3 layout significantly mitigates the wake loss risk to Khobab and Loeriesfontein WEFs, when compared to the existing Kokerboom 3 EA.

ii. **Technology selection**

The type and size of turbine model selected for use at the Kokerboom 3 Wind Farm will influence the magnitude of the wake effect caused by the wind farm. The larger the rotor diameter, the greater the wake effect. But at the same time, the larger the turbine the fewer turbines that are required to achieve the desired wind farm capacity. Reducing wake effects involves a balance between turbine size and number. The exact turbine model to be used can only be selected closer to the time of construction, based on the optimal turbine/s available on the market at the time. However, wake effects will be considered when making a turbine selection and will seek to select a turbine that reduces wake loss to Khobab and Loeriesfontein WEFs as far as reasonably possible. This requirement is captured in the EMPr.

iii. **Compensation**

Despite the implementation of the two mitigation measures listed above, it is theoretically possible that Khobab and Loeriesfontein WEFs may still experience residual losses arising from wake effects caused by the Kokerboom 3 Wind Farm. In recognition of this, the applicant has entered into a Wake Loss Agreement with each of Khobab Wind Farm (Pty) Ltd and Loeriesfontein 2 Wind Farm (Pty) Ltd in terms of which Kokerboom 3 Wind Farm will compensate the Khobab and Loeriesfontein WEFs for any losses incurred by the operational projects due to wake effects caused by Kokerboom 3. The compensation will be based on the actual wake loss caused by Kokerboom 3 – thus regardless of the number or type of turbine installed by Kokerboom 3, the operational wind farms will be suitably compensated for any wake loss caused by the Kokerboom 3 project. Proof of conclusion of the Wake Loss Agreement is included in Annexure H.

Please Refer to Annexure H for the (i) Agreement and (ii) Risks and Mitigation measures (also included in the EMPRr).

3.1.3.2 Co-ordinates

Comment from DFFE:

The EIR must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as weft as the start, middle and end point of all linear activities.

Please refer to the general site information requested by DFFE at the beginning of the report, as well as Annexure H, which provides the co-ordinates for Kokerboom 3, as follows:

- Four corner co-ordinates
- Start, middle and end points of all linear activities

3.1.3.3 Geotechnical statement

Comment from DFFE:

Further, it was mentioned that geotechnical impact assessment would not be undertaken during the EIA phase, however, prior the commencement of construction of the proposed development. You are advised to submit a motivation with the draft and final EIR providing reason why these are not necessary and approval from the relevant authority that this aspect it would not be impacted by the proposed development.

Please refer to Annexure H for the motivation and desk top study concluding the following:

From the published geology map of the region, the geology of the sites is expected to be variable. Dolerite is expected to cover the majority of the site, however sedimentary mudrocks and sandstones are also expected, as well as Quaternary to Recent age alluvial and pan deposits, pedocretes (e.g. calcrete), surface gravels (including doleritic rubble) and various sandy to gravelly soils. Calcrete development is generally sporadic and may range from nodular to hardpan over short distances. Although shallow dolerite rock will present favourable founding conditions for the relevant wind turbines, the wind turbines founded on deeper soil profiles with rock at greater depths present greater risk. The wind turbines situated on deeper soil profiles will potentially require piled foundations, larger-diameter bases[4] or ground improvement.

To provide sufficient information for the geotechnical design of the foundations for the wind turbines and associated infrastructure, it is recommended that further geotechnical investigation work be undertaken at the site, which may include (as appropriate):

- Mapping of the rock outcrops at the wind turbine locations identified to have shallow rock
- Drilling of rotary core boreholes, particularly at wind turbine foundations expected to have deeper soil profiles
- Excavation and profiling of test pits, particularly at wind turbine foundations expected to have deeper soil profiles
- Laboratory testing on samples taken from the test pits and boreholes
- Continuous surface wave testing at selected wind turbine foundation positions to measure in-situ small-strain modulus
- Electrical resistivity testing for grounding system design.

It is recommended the above detailed geotechnical investigations be undertaken closer to the time of construction, once the project is selected as a preferred bidder in REIPPPP – as is standard practise.

3.1.3.4 CCA

Comment from DFFE

On page 15 of 23 of the screening tool report, it is specifically indicated that the proposed site is medium sensitive on civil aviation installations, however on page 8 of the plan of study of the Environmental Impact Assessment dated 04 May 2021 , it is stated that "the applicant has applied to the Civil Aviation Authority (CAA) for approval in terms of the Civil Aviation Regulations, and the CAA approval process will be handled external to the EIA application process. The CAA will consider the potential impacts to civil aviation before granting the requisite CAA approval (if granted). Construction of the facility may not commence without approval from the CAA. Given that potential Civil Aviation impacts will be considered, addressed & regulated directly with the CAA through the CAA's application process, Civil Aviation considerations will not be further assessed in the EIA process" However in terms GN Notice 320 of 20 March 2020, a compliance statement must be prepared and submitted when the civil aviation theme is rated medium sensitive.

[4] Such bases would fall within the foundation parameters assessed in this EIA process.

A civil aviation compliance statement has been compiled and is included in Annexure H. It is not foreseen that any civil aviation installations will be impacted by the planned activities, the nearest not being in use and the next being at a distance too great to be impacted by the proposed development.

Comment on the project has been sought from the CAA as part of the public participation process. The CAA has issued a letter of no objection for the project, and have confirmed that their final approval will be provided once construction is complete, based on as-built specifications. SACAA require applications to be submitted to ATNS for approval, in terms of CAA Notice 1/2021. ATNS (Air Traffic & Navigation Services) have confirmed that the development will have no impact on any civil aviation communication or navigation systems.

Please refer to the letter of no objection for Kokerboom 3 WEF from the CAA and ATNS, appended in Annexure H as per the DFFE Screening Tool and comment received on the Draft Scoping Report from DFFE on 25 May 2021 (Refer Annexure B).

3.1.3.5 Defence statement

Please refer to Annexure H for the relevant defence statement as per the DFFE Screening Tool (Refer Annexure B).

3.1.4 EIR Phase

Based on the findings of the Scoping Report, the EIR Phase was undertaken in terms of the Plan of Study for EIR which formed Annexure F of the Scoping Report. This Plan of Study was approved by the DFFE in their acceptance of the Scoping Report (14 July 2021) (Annexure B). This EIR process has been undertaken in terms of the 2014 EIA Regulations (as amended), with specific adherence to the list of requirements included in Appendix 3 of the regulations. Cross references to where the information is located within this report is included in the table of requirements before the Contents Page.

The aim of the EIR is to, through a consultative process, determine the impact and appropriateness of the proposed project on the receiving environment. This requires ensuring that the development considers the relevant policy and planning context, as well as the social, economic and environmental sensitivities of the area. The EIA process is iterative, thereby allowing for the inclusion of measures that were not identified during the previous phases or allows for the exclusion of those that were not as relevant as initially predicted. Most notably, three of the environmental aspects considered in the Scoping Phase were scoped out and have therefore not been assessed further in this EIR, namely: agricultural potential, palaeontology and flicker as mentioned above. Statements from each specialist has been obtained in this regard and is appended in Annexure D. This EIR incorporates the inputs of the specialists listed below in

Table 3-1, with their specialist reports included in Annexure D of this report.

During the EIR phase some of the specialists revisited the site in order to undertake detailed site walkthroughs of the layout and inform the micro-siting and finalisation of the layout and EMPr. These included the Avifauna, Ecology (Terrestrial and Aquatic) and Heritage specialists who visited the site in June 2021. The remaining specialists provided comments on the final micro-sited layout and additional mitigations where appropriate to inform the finalisation of the EMPr.

The site layout and EMPr have been updated with the findings of the Scoping phase and the detailed specialist assessments and walkthroughs, and are presented for approval together with the granting of the EA (if granted).

Table 3-1 | Appointed specialists

Sub-consulting Specialists		
Avifauna (birds)	Chris van Rooyen	Chris van Rooyen consulting CC
Bats	Stephanie Dippenaar	Stephanie Dippenaar Consulting and Werner Marais from Animalia Consultants
Terrestrial Ecology	Brian Colloty	EnviroSci (Inc)
Aquatic Ecology	Brian Colloty	EnviroSci (Inc)
Socio-economic	Tony Barbour	Private Consultant
Noise	Morné de Jager	Enviro Acoustic Resources (EAR)
Heritage (incl. archaeology)	Jayson Orton	ASHA Consulting (Pty) Ltd
Visual	Stephen Stead	Visual Resources Management (VRM) Africa
Traffic management plan	Hermanus Steyn	Zutari South Africa (Pty) Ltd
EMI/RFI Assessment	Callie Fouché	ITC Services
Independent transport specialist peer review	Athol Schwarz	Private Consultant
CAA	Yolandi Foord	Zutari South Africa (Pty) Ltd
Defence	EAP (Charles Norman)	Zutari South Africa (Pty) Ltd
Geotechnical study	Steven Seymour and Salona Naidoo	Zutari South Africa (Pty) Ltd

The draft EIR will be circulated for a 30-day public comment period, from 14 August 2021 to 14 September 2021. All comments received during this time period will be recorded and responded to in a Comments and Response Report. The draft EIR will be submitted to DFFE for review and comment, with the final EIR being submitted no later than 106 days from the acceptance of the Scoping Report. The competent authority must then, within 107 days of receipt of the EIR and EMPr, in writing -

(a) grant environmental authorisation in respect of all or part of the activity applied for; or
(b) refuse environmental authorisation.

Table 3-2 provides a summary of the key dates of the EIA process for the project to date.

Table 3-2 | Summary of EIA process for the project

EIA processes	
The Pre-Application Phase	
Commencement of a 12-month period of monitoring of bird and bat specialists	August 2019 – June 2020 (Bats) June 2019 – March 2020 (Birds)
Pre-Application Meeting with DEA	14 July 2020
Site visits by Specialists	February 2020 – May 2020
Acceptance of PP Plan by DFFE	29 October 2020
Site visit by EAP	April 2021
Scoping Phase	
Submission of Application to DFFE	5 May 2021
Submission of draft Scoping Report to DFFE	5 May 2021
Acknowledgment of Receipt of Application and Scoping Report from DFFE	12 May 2021
Comment of the Draft Scoping Report	25 May 2021
30-day PPP on Scoping Report - Refer to Section 3.3 and Annexure C for details	7 May 2021 – 7 June 2021
Submission of final Scoping Report to DFFE	14 June 2021
DFFE Decision: Acceptance of the Scoping Report	14 July 2021
EIR Phase	
Submission of draft EIR to DFFE	13 August 2021
30-day PPP on EIR - Refer to Section 3.3 and Annexure C for details	14 August 2021– 14 September 2021
Submission of final EIR to DFFE	Before 23 September 2021
DFFE Decision: Grant / Refuse Environmental Authorisation	Pending (decision to be issued within 107 days of submission of final EIR to DEA) 1 February 2021

3.2 Methodology

3.2.1 Specialist Assessments

To provide a scientific assessment that is transparent and robust, a clear methodology is required. Although each specialist required a methodology that was specific to their investigation (detailed in their reports in Annexure D), they were each given the following ToR.

- Undertake a site investigation to determine the *status quo* and identify any sensitive features or no-go areas;
- Provide shapefiles of all sensitive features;
- Assess all proposed site alternatives associated with the Kokerboom 3 Wind Farm and associated infrastructure;
- Make use of the Zutari Impact Assessment Methodology (explained below in Section 3.2.2) when assessing impacts for all alternatives proposed as part of the Kokerboom 3 Wind Farm, as well as cumulative impacts (detailed below in Section 3.2.3);
- Provide a detailed description of appropriate mitigation measures that can be adopted to reduce or avoid negative impacts and improve positive impacts for each phase of the project, where required, and the significance of impacts pre- and post-mitigation;

- Provide a summary of succinct and practical recommendations based on mitigation measures identified to form the basis of environmental authorisation requirements, should the development be authorised; and
- Comply with the content requirements for specialist reports listed in Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014, as amended)
- Assess the cumulative impact of the proposed development as per comment received from DFFE on Draft Scoping Report (dated 25 May 2021) (Annexure B)

3.2.2 Assessment Methodology

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criteria based on a seven-point scale (refer to Table 3-3); and the significance is auto-generated using a spreadsheet through application of the calculations in Figure 3-2. Specialists can comment where they disagree with the auto-calculated impact significance rating.

Calculations

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** *(*size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible (very low), minor (low), moderate (medium) or major (high), and the type would be either positive or negative.

Figure 3-2 | Calculation of significance

Table 3-3 | Assessment criteria for the evaluation of impacts

Criteria	Numerical Rating	Category	Description
Duration	**1**	**Immediate**	Impact will self-remedy immediately
	2	**Brief**	Impact will not last longer than 1 year
	3	**Short term**	Impact will last between 1 and 5 years
	4	**Medium term**	Impact will last between 5 and 10 years

	5	**Long term**	Impact will last between 10 and 15 years
	6	**On-going**	Impact will last between 15 and 20 years
	7	**Permanent**	Impact may be permanent, or in excess of 20 years
Extent	**1**	**Very limited**	Limited to specific isolated parts of the site
	2	**Limited**	Limited to the site and its immediate surroundings
	3	**Local**	Extending across the site and to nearby settlements
	4	**Municipal area**	Impacts felt at a municipal level
	5	**Regional**	Impacts felt at a regional level
	6	**National**	Impacts felt at a national level
	7	**International**	Impacts felt at an international level
Intensity	**1**	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered
	2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
	3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	**1**	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also taken into account. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Table 3-4, Table 3-5 and Table 3-6 respectively.

Table 3-4 | Definition of confidence ratings

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 3-5 | Definition of reversibility ratings

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 3-6 | Definition of irreplaceability ratings

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

3.2.3 Assessment of Cumulative Effects

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects has therefore been considered for all renewable energy developments (wind and solar) within a 30km radius of the proposed site. Developments that would be considered here include:

- Developments which are operational;
- Developments which have received Environmental Authorisation; and
- Developments under construction.

The relevant projects with potential associated cumulative impacts have been identified as detailed in Table 3-7 and illustrated in Figure 3-3 (Refer also Annexure I) on the following page.

Table 3-7 | Cumulative projects

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	• Portion 2 of the Farm Graskoppies No. 176; and • Portion 1 of the Farm Hartebeest Leegte No. 216.
Hartebeest Leegte Wind Farm	EA issued	Mainstream	Wind	235MW	• Entire part of the Remainder of the Farm Hartebeest Leegte No. 216.

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Xha! Boom Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Entire part of Portion 2 of the Farm Georg's Vley No. 217.
Ithemba Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Western portion of Portion 2 of the Farm Graskoppies No. 176; and • Western portion of Portion 1 of the Farm Hartebeest Leegte No. 216.
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227
Kokerboom 1 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Leeuwbergrivier No. 1163; and • Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Springbokpan No. 1164; and • Remainder of the Farm Springbok Tand No. 215.
Kokerboom 4 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1733 (Pty) Ltd (BVI)	Wind	60MW	• Remainder of the Farm Aan De Karree Doorn Pan No. 213

The cumulative assessment is included in Chapter 7. Specialists were asked to incorporate the following in their specialist reports:

- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project (
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.

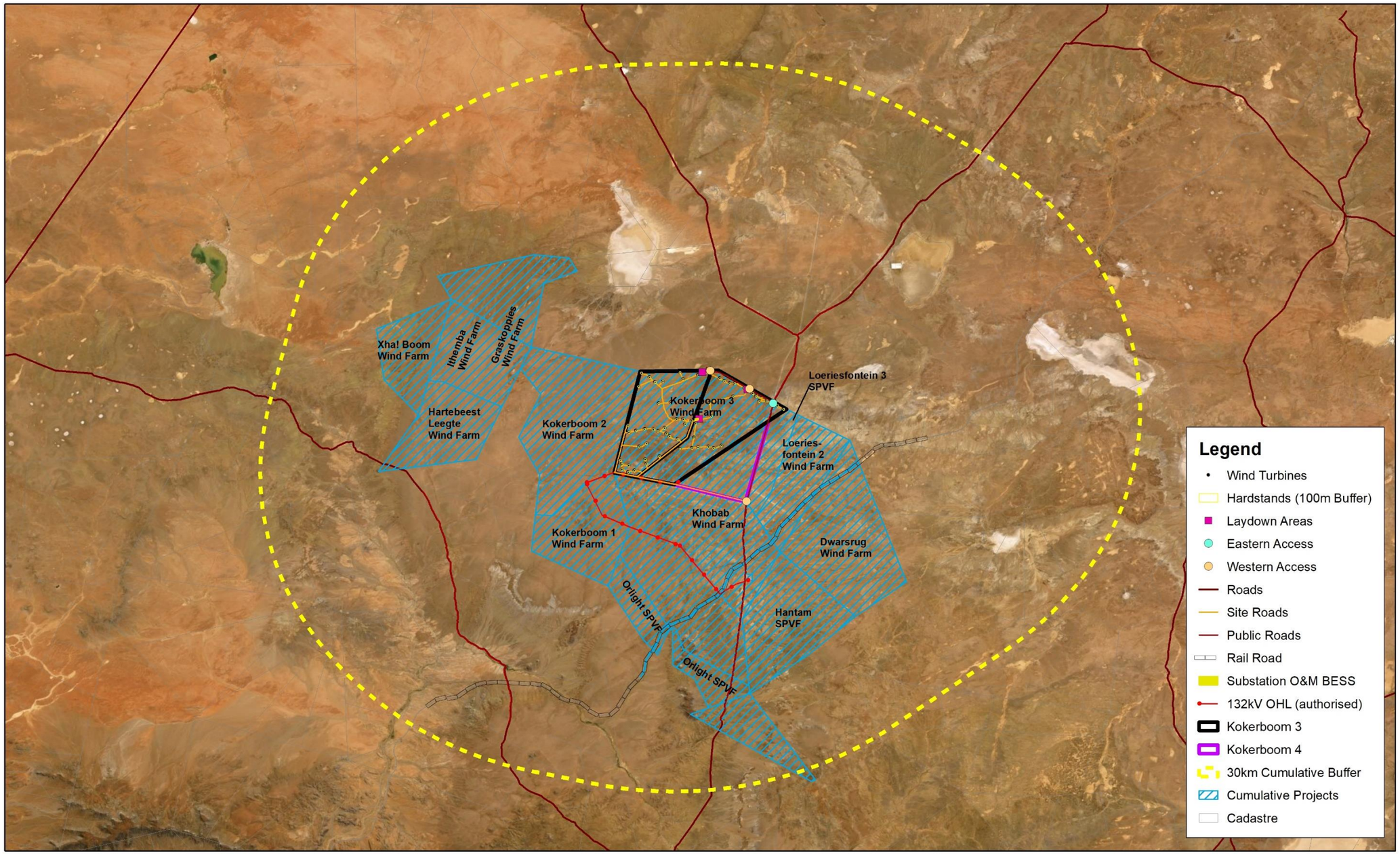


Figure 3-3 | Location of cumulative projects in relation to the proposed Kokerboom 3 Wind Farm

3.3 Public Participation

As illustrated above in Figure 3-1 three stages of public participation are included in the EIA process, at the Pre-Application, Scoping and EIR phase, respectively. More information on the Public Participation Process (PPP) is included in Annexure C. Refer to Figure 3-4 below for a summary to date.Figure 3-4 | Public participation in the EIA process

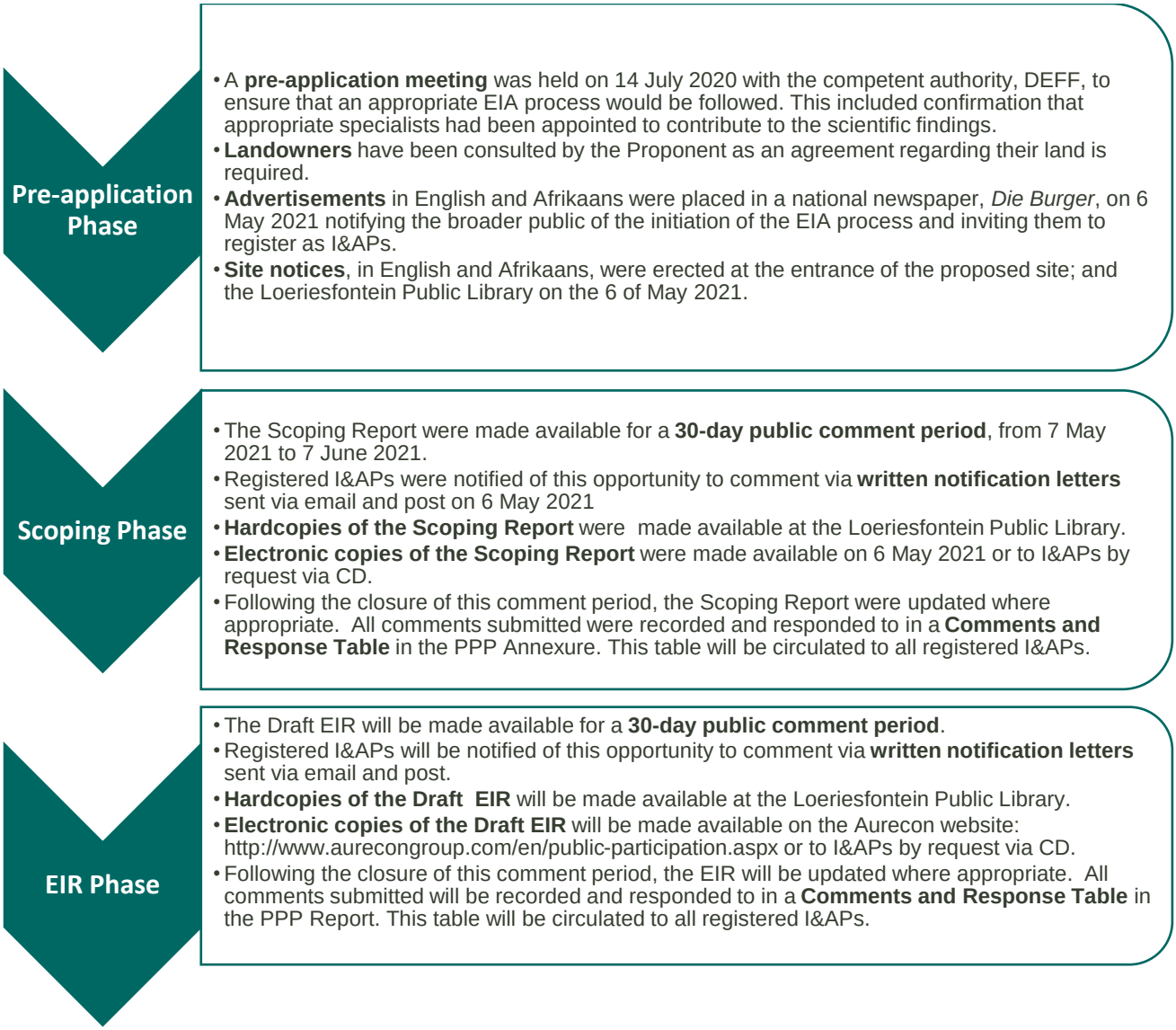


Figure 3-4 | Public participation in the EIA process

3.3.1 Relevant Stakeholders

A database of I&APs was developed for the proposed Kokerboom 3 WEF during the Pre-Application and Scoping phases. This database was initiated by including the details of the following affected parties (refer to Annexure C for the comprehensive list):

- Landowners and adjacent landowners;
- Relevant district and local municipal officials;
- Relevant national and provincial government officials;

- Key stakeholders in renewable energy projects;
- Organisations in the area;
- Provincial and local authorities and parastatal organisations;
- National departments and organisations; and
- Other national/ provincial departments where deemed necessary.

The DFFE provided additional I&APs to be included in the project database in the acceptance of the final scoping report. These key stakeholders have been updated in the CRR and were included in the public participation process on the EIR and will be notified of the EIA process going forward.

All comments received and responses provided have been included in the CRR in Annexure C.

3.4 Assumptions, Limitations and Gaps in Knowledge

In undertaking this investigation and compiling the EIR, the following has been assumed:

- The information provided by the client is accurate and unbiased, and no information that could change the outcome of the EIA process has been withheld.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed Kokerboom 3 WEF.
- The EIA process is based on Best Practice Guidelines which were available at the time of writing this Report.
- The turbine layout and proposed associated footprints have been designed following specialist input of environmental sensitivities on site as well as a final site walkdown by relevant specialists in June 2021. The site layout presented in this EIR is the final layout that has been micro-sited and confirmed by all the appointed specialists.

In undertaking this EIR process, a few gaps in knowledge were evident. However, it is the opinion of the EAP that the gaps in knowledge do not fundamentally alter the impact assessment, or the findings presented in this report. These gaps are as follows:

- No indication of commencement date of construction phase.
- Lack of precise plan for decommissioning of the wind farm, but it is understood that decommissioning would be required to comply with the prevailing legislation at the time.

Any gaps that have been encountered by the specialists are identified in their respective assessments and identified in Chapter 6.

The assumptions, limitations and gaps in knowledge will not affect the EAPs opinion of the proposed Kokerboom 3 WEF.

4 ALTERNATIVES CONSIDERED

4.1 Types of Alternatives

The NEMA requires that alternatives are considered during the EIA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline on Alternatives (2013)[5] states that: "*every EIA process must identify and investigate alternatives, with feasible and reasonable alternatives to be comparatively assessed. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives were found, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not proceeding, is required during the assessment phase. What would, however, have to be provided to the Department in this instance is proof that an investigation was undertaken and motivation indicating that no reasonable or feasible alternatives other than the preferred option and the no-go option exist*."

The 2014 EIA Regulations (GN R982, as amended) provide the following definition: "*Alternatives*", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the -

(a) property on which or location where the activity is proposed to undertaken;
(b) type of activity to be undertaken;
(c) design or layout of the activity;
(d) technology to be used in the activity;
(e) operational aspects of the activity; and
(f) includes the option of not implementing the activity ("No-Go" alternative).

In addition to the list above, the 2013 DEA&DP Guidelines on Alternatives also considers the following as alternatives:

(a) **Demand alternative:** Arises when a demand for a certain product or service can be met by some alternative means (e.g. the demand for electricity could be met by supplying more energy or using energy more efficiently by managing demand).
(b) **Input alternative:** Input alternatives are applicable to applications that may use different raw materials or energy sources in their process (e.g. Industry may consider using either high sulphur coal or natural gas as a fuel source).
(c) **Routing alternative:** Consideration of alternative routes generally applies to linear developments such as power line servitudes, transportation and pipeline routes.
(d) **Scheduling and timing alternative:** Where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result.
(e) **Scale and Magnitude alternative:** Activities that can be broken down into smaller units and can be undertaken on different scales (e.g. for a housing development there could be the option of 10, 15 or 20 housing units. Each of these alternatives may have different impacts).

The following types of alternatives are most pertinent to the proposed project and are detailed further below:

- Location alternatives;
- Layout alternatives;
- Technology alternatives; and
- The "no-go" alternative.

[5] This guideline has been used as a best practice tool since it is the most recent guideline on alternatives.

4.2 Location Alternatives

The location for the Kokerboom 3 Wind Farm was selected based on the following parameters:

- Good wind resource;
- Proximity to an Eskom substation which has sufficient capacity (or planned capacity) to support the proposed WEF project;
- Close proximity to Eskom Helios substation (i.e. shorter grid connection required, which minimises costs, energy losses and environmental impacts);
- Proximity of authorised transmission line for the original Kokerboom 3 WEF application (DFFE Ref. No.:14/12/16/3/3/1/1818).
- Relatively flat site, which makes construction easier and less expensive than on an undulating site;
- Relatively remote site (anticipated lower visual, noise and dust impacts);
- Existing landowner agreements and landowner support;
- Other WEFs have been constructed in the area (e.g. Loeriesfontein and Khobab Wind Farms), and existing haulage routes can be utilised. Also provides an opportunity to align the powerlines for the proposed WEFs with those of other WEFs in the area, thus limiting the disturbance corridors in the landscape;
- The land has a low agricultural potential and can only be used for low intensity livestock grazing;
- Knowledge gained from the original Kokerboom 3 EIA application and recent site visits completed by specialists, indicates that the site is feasible from an environmental sensitivity point of view; and
- The current application entails the revision of the existing authorised Kokerboom 3 project on the subject properties, and hence alternate sites outside of the subject properties could not be considered.

The Proponent has considered several alternative sites in the Western and Northern Cape Provinces. The consideration of a number of social, economic and technical constraints resulted in the Kokerboom 3 WEF which is a revision of the existing authorised Kokerboom 3 WEF and as such an alternate location could not be considered.

Based on these considerations, the Kokerboom 3 WEF site has been selected due to the favourable factors listed above.

4.3 Design and Layout Alternatives

A single site layout has been considered in this EIR as an outcome of the EIA based on *inter alia* the following criteria:

- Technical constraints:
  - Spatial orientation requirements of turbines and associated infrastructure (e.g. roads); and
  - Layout relative to other existing infrastructure, such as powerlines and the Helios substation.
- Environmental constraints:
  - Wind resource profile (this has significant technical constraints as well);
  - Topographical constraints, including surface and groundwater;
  - Biophysical constraints (presence of sensitive or protected plant or faunal communities, and identified as “no-go” areas);
  - Required setbacks from property boundaries; and
  - Socio-economic constraints (such as aesthetics, sensitive heritage areas, sensitive noise receptors).

Prior to the Scoping phase, specialists were commissioned to assist with the design and placement of the turbines and internal roads, through the identification of sensitive features and constraints in a screening or constraints assessment. This provided input into the iterative design process, allowing the Applicant to avoid and or minimise potential impacts by aligning the layout to avoid impacts prior to the commencement of the formal Environmental Impact Assessment process, i.e. prior to the Scoping and EIA phases.

During the Scoping Phase, the environmental, social and (to some degree) technical sensitivities of the full extent of the study area were identified and considered by the specialists, stakeholders and the Proponent. An initial turbine layout was provided during the Scoping Phase and is illustrated below as the Initial Layout (Figure 4-1). Following the analysis of further wind data and the final results of the bat and bird monitoring periods and the freshwater assessment, as well as the results from the second heritage and terrestrial ecology specialist site visits and walk throughs during June 2021, the turbine layout was refined to the Final Micro-sited Layout (Figure 4-2Figure 4-1). The following environmental sensitivities were considered in the development of the preferred layout:

- Bats
  - High Sensitivity & High Sensitivity Buffers = NO GO (Major -) for turbines and blades
  - Hardstands (100m buffer)
- Ecology
  - High Sensitivity Drainage areas = NO GO (Major -) for turbines
  - High Sensitivity areas = NO GO (Major -) for turbines
  - Hardstands (100m Buffer)
- Freshwater Ecosystems:
  - Watercourses (including 32m buffer) = NO GO (Major -) for turbines.
  - Wetlands & dams = NO GO (Major -) for turbines.
  - Hardstands (100m Buffer)
- Heritage (archaeological finds):
  - All identified sites = NO GO for development
  - Hardstands (100m Buffer)
- Noise:
  - Buffer areas around noise-sensitive receptors = NO GO (Major -) for turbines.
- Avifauna:
  - 200m buffer areas around sensitive sites (point features) = NO-GO (Major -) for turbines and their blades.
  - Avifaunal corridors: A 1km broad turbine-free corridor was implemented between the pans in the following manner: Pan 1 to Pan 2, Pan 2 to Pan 3, Pan 3 to Pan 4
  - Hardstands (100m Buffer)

Two substation locations were proposed, and specialists were asked to consider both locations and advise which option is preferred and should be taken forward in the EIA process. The final location is illustrated in Figure 1-1.

The Final micro-sited layout presented in this Draft EIR (Figure 4-2) has been subject to a detailed walkthrough by the relevant specialists and does not require further walkthrough before construction. Specialists who did not revisit the site have provided comment on the Final micro-sited layout and additional mitigations to finalise the EMPr, where appropriate.

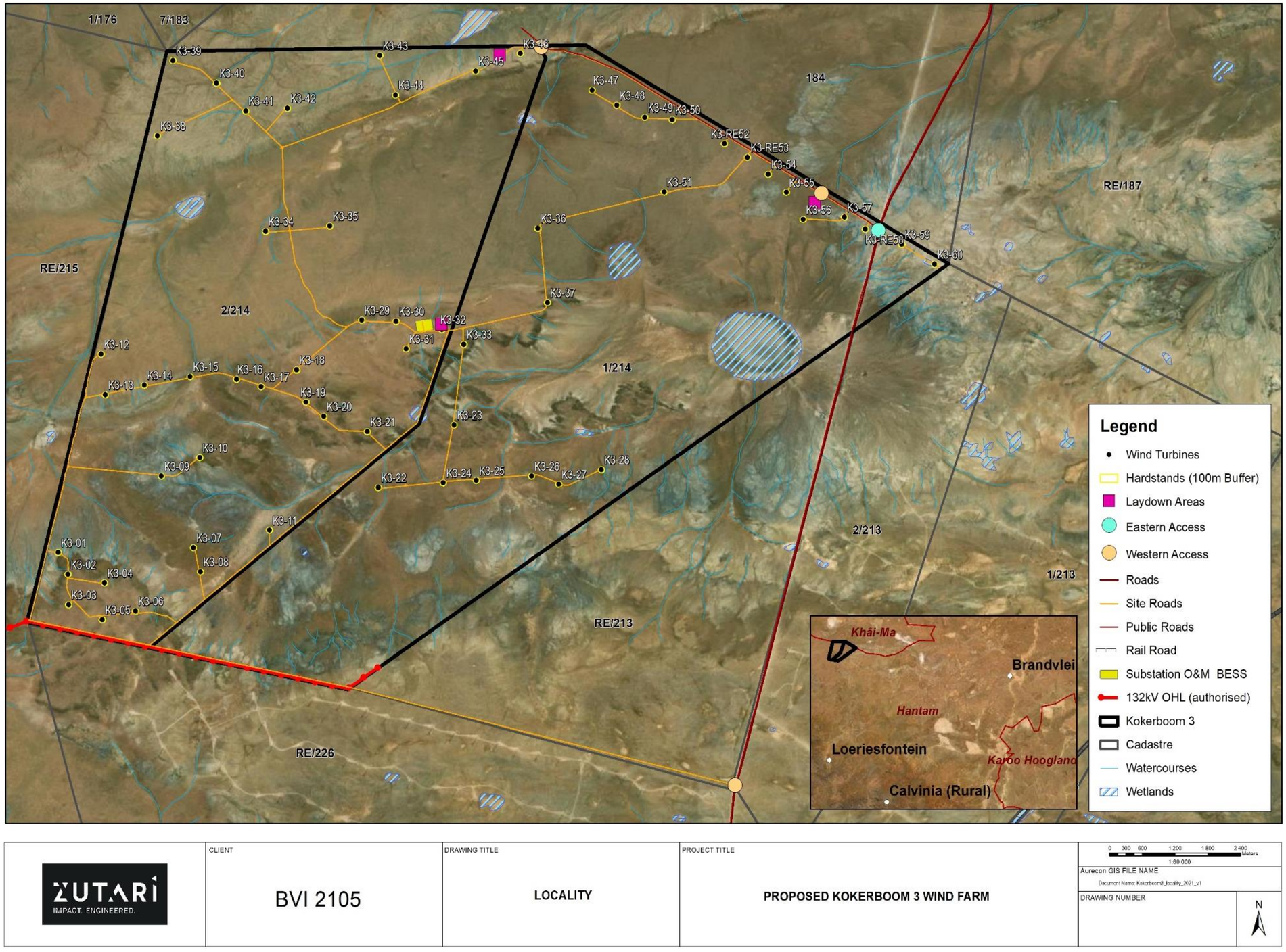


Figure 4-1 | Site layout considered for the Kokerboom 3 Scoping Phase

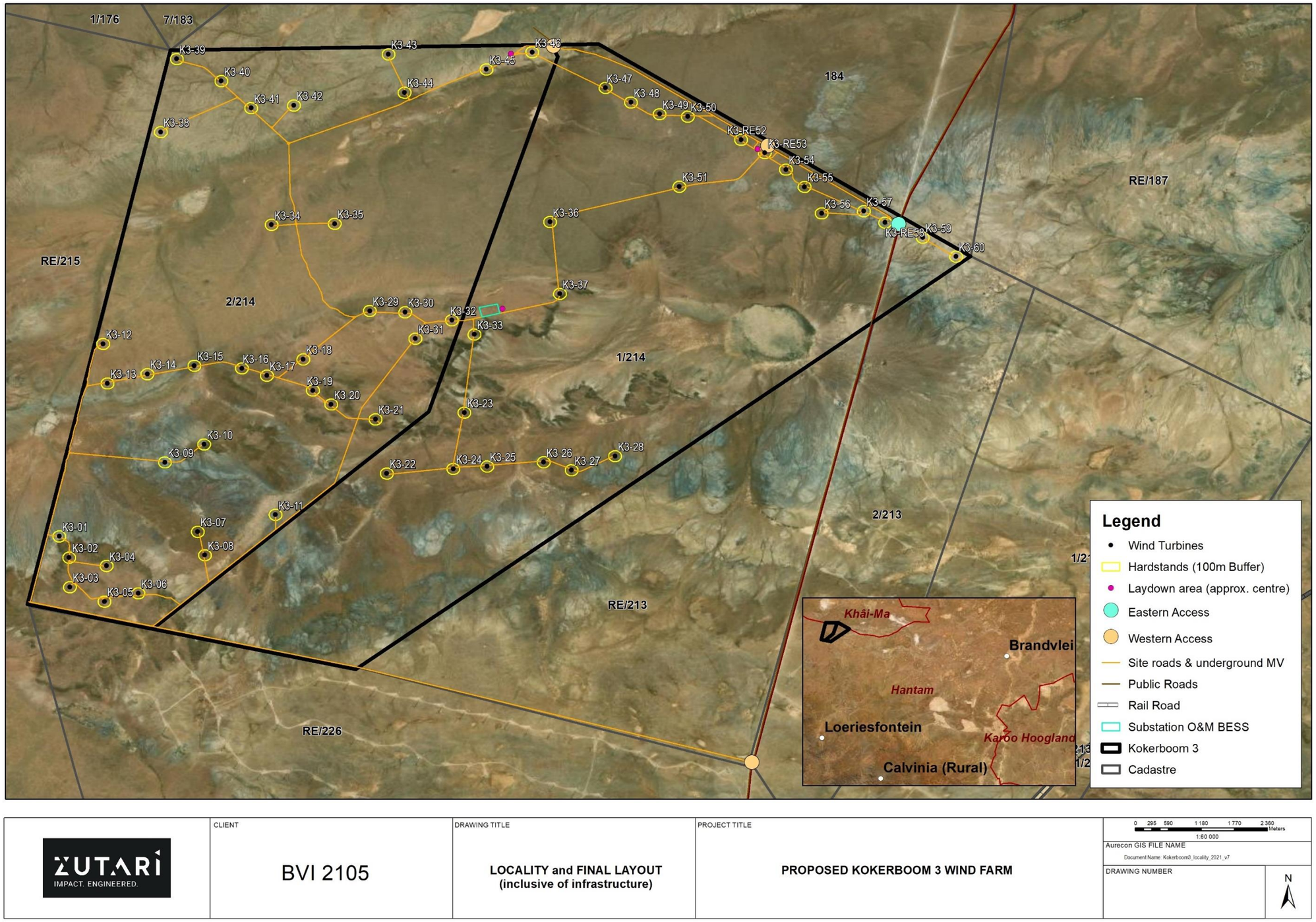


Figure 4-2 | Micro-sited and Final layout considered for the Kokerboom 3 Wind Farm

4.4 Technology Alternatives

The most important factors that are considered when selecting a turbine for any site are the annual average wind speed, reference wind speed, wind shear and turbulence, the return period for extreme wind conditions and wind direction (i.e. wind resource profile). Monitoring of the wind resource on site was undertaken, and the findings of the wind resource profile during the Pre-Application and Scoping phases were used to provide the turbine layout (Figure 4-2Figure 4-1). Other determining factors when selecting the preferred turbine are efficiency, full load hours and the capacity factor. The pricing of relevant technology at the time of construction is also a key factor, as well as the exchange rate for imported components. Turbine technology is also continually improving, with newer and more efficient turbine models being released on an ongoing basis. Based on these characteristics a turbine which is best suited to the site will be selected closer to the time of construction based on the optimal turbine available in the market at the time and cannot be confirmed during the EIA process.

To derive the desired capacity for the wind farm (up to 300MW), the Proponent is proposing to construct up to 60 turbines of up to 6.5 MW each (note that overall installed capacity will not exceed 300 MW, via the appropriate selection of turbine size and number). The turbines will have a hub height of up to 150 m and blades of up to 90 m in length (i.e. up to 180 m in rotor diameter). To allow for assessment of potential impacts of the turbines in this study, a maximum upper tip height of 240 m is assumed.

Turbine alternatives are therefore not considered as part of the EIR, however the impacts that are dependent on turbine model, e.g. noise and visual, were assessed using a worst-case scenario approach detailed in each specialist study (Chapter 6 and Annexure D).

4.5 Routing Alternative for Linear Activities

4.5.1 Transmission Lines

A 132 kV overhead transmission line received environmental authorisation (DFFE Ref. No.:14/12/16/3/3/1/1818) independently to the authorised and proposed Kokerboom 3 WEF. This overhead transmission line will be used to evacuate the power from the proposed WEF into the national grid at the Eskom Helios substation. A refined transmission line route is currently being applied for through a separate Basic Assessment Process (DFFE Ref No. 14/12/16/3/3/1/2367).

Medium voltage (MV) cables, up to 33 kV, will be used to connect the turbines with the proposed onsite substation and will be placed underground within the road reserve.

4.5.2 Roads

Route alternatives include different access and service route alternatives.

Given the extent of the site, it is likely that all 4 proposed access points will be utilised during construction and/or operations. The requirements of the Provincial Roads Authority will be adhered to during the establishment and use of the access points off the public road.

Internal service route alternatives are dependent on the micro-siting of wind farm towers, environmental constraints identified during the EIA process and certain design criteria as follows:

- The avoidance of environmental sensitivities as far as possible.
- Use of existing roads as far as possible.

This has been considered in the specialist assessments of the study area and the final micro-sited layout as contained in this Draft EIR.

4.6 No-Go Alternative

The assessment of alternatives must always include the “no-go” option as a baseline against which all other alternatives must be measured. The option of not implementing the activity must always be assessed and to the same level of detail as the other feasible and reasonable alternatives. The “no-go” option is taken to be the existing rights on the property, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property and other rights holders. The No-Go option would also imply that the existing environmental authorisation for Kokerboom 3 Wind Farm would remain in place, and that the Proponent cannot shift turbines northwards to reduce wake interactions with the existing operational wind farms adjacent to the site. The currently authorised Kokerboom 3 wind farm will have more significant wake interactions with the operational Khobab and Loeriesfontein Wind Farms, which would be a less optimal wind farm that the revised Kokerboom 3 Wind Farm currently proposed.

4.7 Summary of Alternatives

In summary, several technical requirements and environmental considerations have informed the selection of the location for the proposed project, therefore no other location alternatives are assessed in this EIR. The early involvement of specialists to identify environmental sensitivities in the wider study area has allowed for a final site layout which was developed, which accommodates the identified environmental sensitivities while optimising the use of the wind resource on site (Figure 4-2). This final layout was subject to detailed walkthrough by specialists (Avifauna, Heritage, Aquatic and Ecology) and is acceptable and do not require further walkthrough before construction This is assessed against the “no-go” option for each environmental discipline.

5 DESCRIPTION OF THE PROPOSED PROJECT

5.1 Description of Proposed Wind Farm

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 5-1.

Table 5-1 | Summary of technical details for the proposed Kokerboom 3 Wind Farm

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	• Up to a maximum of 60 wind turbines. • Turbine envelope: o Rotor diameter: up to 180 m (90 m blade) o Hub height: up to 150 m o Rotor top tip height: up to 240 m o Steel or concrete towers • Kokerboom 3 has a targeted nameplate capacity of up to a maximum of 300 MW.	-
Turbine Foundations and Hardstands	At each turbine position there will be • A hardstand area of up to 150 m x 100 m • A laydown/assembly area of ~150 m x 15 m 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).	3,2ha foundations (permanent) 3ha foundations construction footprint (temporary, in addition to permanent footprint) 90ha hardstand (permanent) 13,5ha laydown (temporary)
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	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. 8m 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.	±76ha (8m width) (permanent) 114ha (12m width) (temporary)
Facility Substation and O&M Complex	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: • Facility substation (approx. 1ha) • O&M building (approx. 0.5 ha) • Oil storage area (less than 30m^3) (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. 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.	up to 45ha (temporary)
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

5.1.1 Site Location and Extent

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 (Figure 1-1). The Kokerboom 3 Wind Farm footprint is approximately 175.6 ha (temporary) and 168.2ha (permanent) and will be located on the farms listed in Table 5-2 below. The final layout and location are as per Figure 1-1 (Refer also to Annexure I).

Table 5-2 | Farm details for Kokerboom 3 Wind Farm

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
Gert Johannes Lombard	1/214	C01500000000021400001	Karree Doorn Pan (Portion 1)	5,094.23
TR2 Immobilien GmbH	2/214	C01500000000021400002	Karree Doorn Pan (Portion 2)	5,094.24
Gert Johannes Lombard	RE/213	C01500000000021300000	Remainder of Aan de Karree Doorn Pan No 213	2,580 ha

5.1.2 Technical Description of a WEF

A wind farm, (or Wind Energy Facility (WEF)), requires several key components to generate electricity at a large scale. As illustrated in Figure 5-1, this includes wind turbines, powerlines and substation facilities to collect the generated electricity and distribute it to other users and the associated infrastructure that connects the wind farm to ensure efficiency, such as roads, transformers and cabling etc.

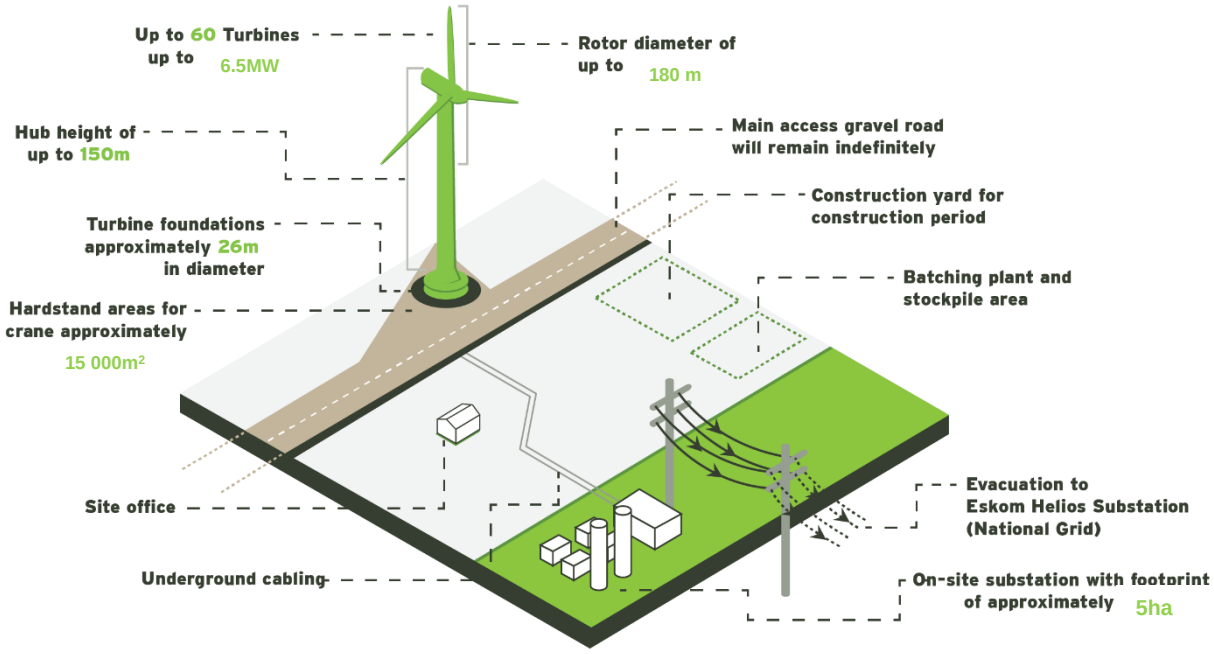


Figure 5-1 | Components of the Kokerboom 3 Wind Farm. Note that the diagram is for illustrative purposes only, is not to scale and does not represent the proposed layout of site facilities.

The following subsections provide additional information on wind turbine technology (Section 5.1.2.1), transmission and distribution (Section 5.1.2.2) and other associated infrastructure (Section 5.1.2.3).

5.1.2.1 Wind Turbine Technology

Wind turbines can rotate about either a horizontal or vertical axis. Turbines used in wind farms for commercial production of electricity are usually horizontal axis, three-bladed and pointed into the wind by computer-controlled motors, as is proposed for this project. These have high tip speeds of over 320 km/hour, high efficiency, and low torque ripple, which contribute to good reliability. Figure 5-2 and Figure 5-3 provide illustrations of the external and internal components that make up a typical wind turbine.

Turbine technology is developing rapidly at a global scale and many different turbines are available which can be used to meet site-specific requirements. The proponent will only finalise the decision on which turbine closer to the construction period. This EIA process therefore considers a range of criteria that the selected turbine shall meet. These are illustrated above in Figure 5-1 and are listed below in Table 5-3.

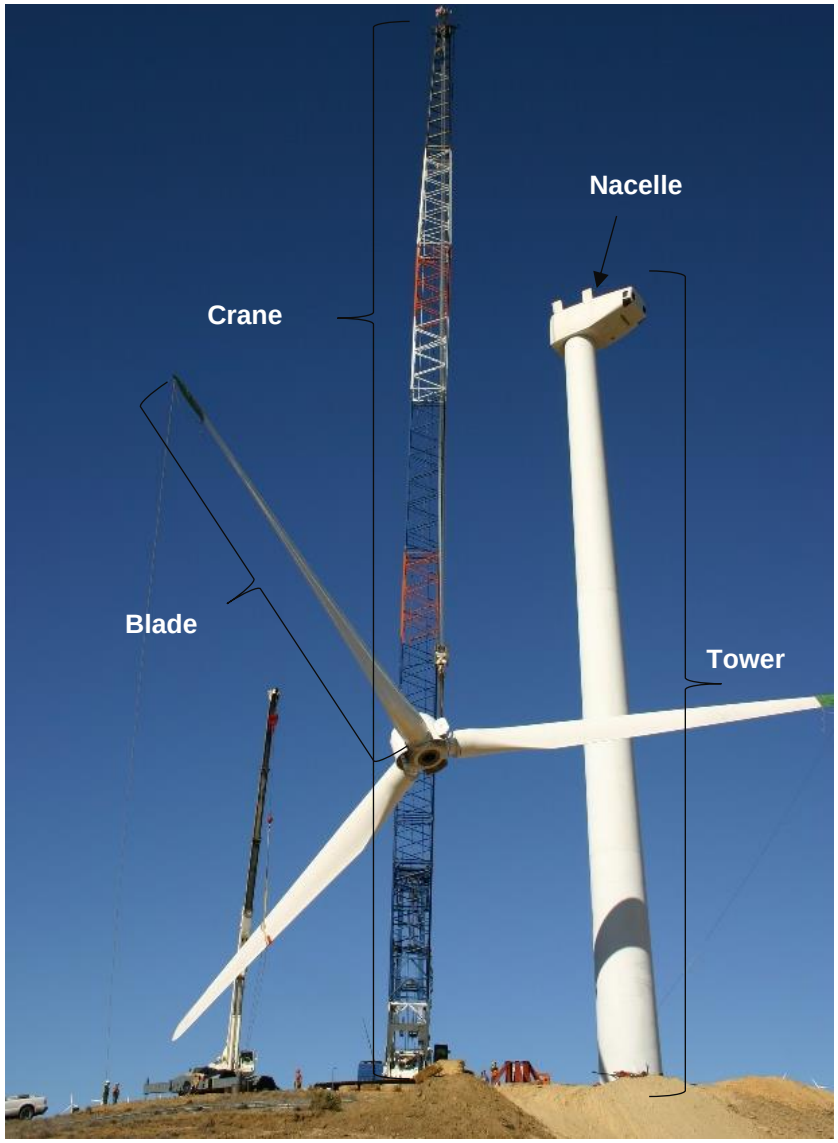


Figure 5-2 | External components of a wind turbine tower

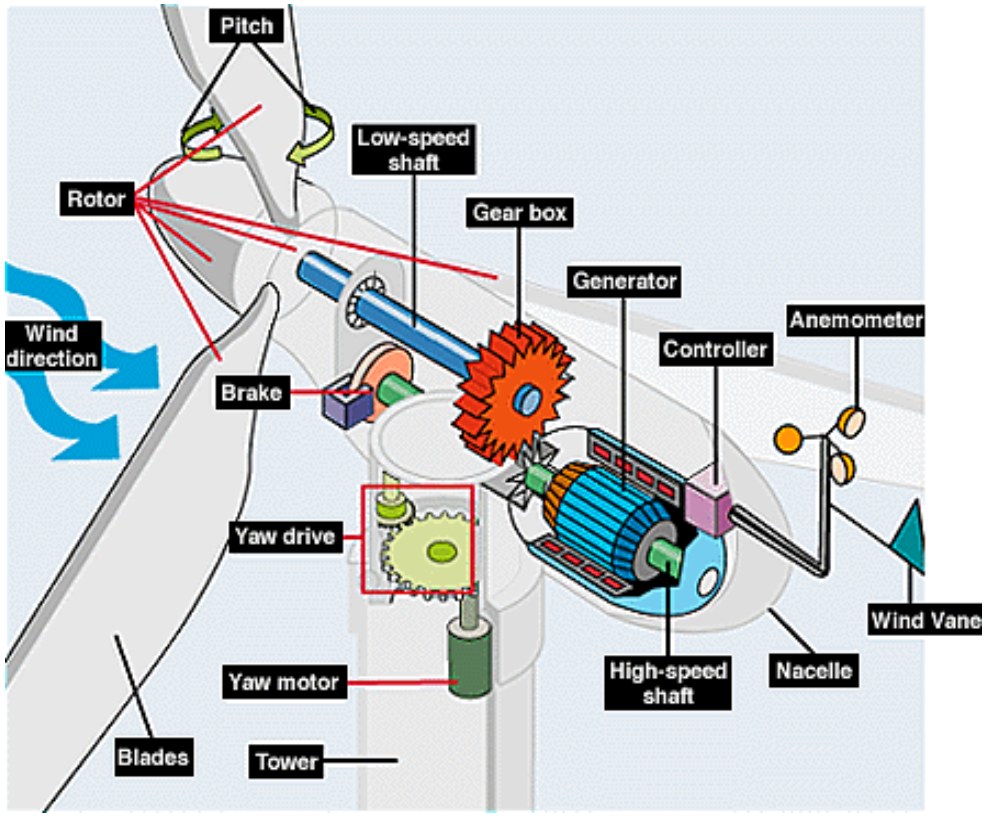


Figure 5-3 | Internal components of a typical wind turbine

The criteria proposed for the wind turbine from this EIA process are detailed listed below in Table 5-3.

Table 5-3 | Turbine components

Component	Description
Rotor and blades	The rotor has three blades that rotate at varying speeds depending on wind speed.
	The blades are usually coloured white or light grey.
	The blades for the project would be up to 90 m long with a rotor diameter up to 180 m.
Nacelle	Wind direction is measured by a wind vane situated on the back of the nacelle. The nacelle can turn the blades to face into the wind ('yaw control') to maximise power output.
	The nacelle also contains the generator, control equipment, gearbox and wind speed instrument (anemometer) in order to monitor the wind speed and direction.
Generator	The generator converts the turning motion of the blades into electricity. A gear box is commonly used for stepping up the speed of the generator. Inside the generator, wire coils rotate in a magnetic field to produce electricity.
Transformer	Each turbine has a transformer that steps up the voltage to match the transmission line frequency and voltage for electricity evacuation/distribution. The transformer may be located inside the turbine tower, or within a small external housing at the base of the tower.
Tower	The tower is constructed from tubular steel and/or concrete and supports the rotor and nacelle.
	For the proposed project the tower would be up to 150 m tall, depending on the selected turbine. This height will be referred to as "hub height."[10]
Foundation and hardstands	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).
	At each turbine position there will be (within a 100m radius of the turbine base): • A hardstand area of up to 150 m x 100 m • A laydown/assembly area of ~150 m x 15 m

5.1.2.2 Transmission and Distribution

For the electricity generated by the wind turbine to be used, it needs to be collected, transformed and then distributed through the national grid. The step-up process and infrastructure that occurs within the footprint of Kokerboom 3 Wind Farm is included in this EIA process.

On-site Substation, Transformer and Operational and Management complex

Energy produced by the turbines will be transmitted via medium voltage cables to the on-site collector substation. This substation is comprised partly of a control room which will measure power voltage, input, output, power fluctuation and other performance information. The remainder of the substation is comprised of facilities and infrastructure typical of a substation, including an area with a subterranean earthing mat, onto which several concrete plinths are constructed. This, together with a few earthing rods, will provide an earth for lighting and possible short circuit currents. Switching gear, step-up transformers and protection equipment are also mounted on concrete plinths within the collector station. The entire substation facility as well as the Operational and Management (O&M) complex will cover approximately 5ha. The following infrastructure would be located within 5 ha area:

- Facility substation (approx. 1ha)
- O&M building (approx. 0.5 ha)
- Oil storage area (less than 30m^3) (approx. 0.1 ha)

- Battery Energy Storage Facility (approx. 2 ha)
- Associated facilities including the parking area

The substation will contain a transformer to increase ("step-up") the voltage of the electricity from 33kV to 132kV for transmission into the Helios Main Transmission Substation (MTS) and national grid. Eskom's Helios MTS (Figure 5-4) is located approximately 12 km southeast of Kokerboom 3 Wind Farm and has been identified as suitable to connect the wind farm to the national grid. This substation is also the connection point for the Loeriesfontein Wind Farm and Khobab Wind Farm.

Figure 5-4 | Helios MTS

Cabling and transmission

Each turbine will be connected to the on-site substation via medium voltage cables (~33kV lines). 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

The proposed layout of transmission and distribution infrastructure is illustrated below in Figure 1-1 (Refer also to Annexure I).

5.1.2.3 Additional Infrastructure

Access, Service Roads and Sidings

Access to the site is off the public Granaatsboskolk (Nuwepos) Road, which traverses the north-east section of the site. This gravel road has been widened to accommodate the transportation of abnormal loads for the Loeriesfontein and Khobab Wind Farms, which have been developed by Mainstream Renewable Power adjacent to the Kokerboom 3 Wind Farm.

Access and service roads will be required to access the wind farm area as well as each turbine site. 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 20m wide road reserve is required; this accounts for a 6m road surface width, 1m for side drains either side, and a further 6 m either side of the road surface for MV cable trenches and associated disturbance.

These roads are needed to accommodate low bed trucks delivering turbine components as well as the mobile high lift cranes where needed to erect the turbines themselves, amongst other heavy construction vehicles. After construction the road would be rehabilitated down to 8m wide (6m wide road surface + 1m drain either side) (ie. 8m road width is permanent with an additional 12m 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. Where site roads will cross drainage channels, appropriate watercourse crossings will be installed in accordance with technical requirements of such crossings and the recommendations of the aquatic specialists (Appendix D). Typical heavy loads are illustrated in Figure 5-5.

Figure 5-5 | Abnormal freight (tower section in low load configuration (top) and blade (bottom))

Fencing

A security gate and associated guardhouse will be placed at the entrance to the wind farm. This is aimed at preventing unauthorised vehicular access to the wind farm. This access and security point is proposed at the turnoff to the access road on the Nuwepos Road.

No fencing will be used around individual turbines themselves and existing fencing will remain around the perimeter of the properties. This will enable livestock and wild fauna to continue to utilise the area underneath the turbines as rangeland or a migratory corridor. Fencing will be erected around the onsite substation and operations and maintenance complex for security and safety reasons during the operational phase. The temporary construction camp (described further below) will also be fenced and should be kept secure for the duration of the construction period. Additional construction phase fencing will be brought on where needed in consultation with landowners.

Water and Electricity

Water within the Local Hantam Municipality is principally sourced from boreholes (36%) and dams (60%). Loeriesfontein. Within the Hantam Municipality's IDP the identification of new water sources in Loeriesfontein has been identified as a key project, and the Municipality is in the process of developing a water augmentation scheme to supply additional water to Loerisfontein from additional boreholes on surrounding farms.

A preliminary approximation of the water requirements for the construction phase of the proposed WEF are as follows:

- During the construction period (18 - 24 months) the water requirement varies from 5 to 30 kℓ per day. This water will largely be used for the following: road construction; hardstand compaction; concrete foundations; cleaning equipment after concrete pours and dust suppression on roads.
- During the operational phase (approximately 20 years) the water requirement would be an estimated 7kℓ per month for 11 months of the year, increasing to approximately 300kℓ per month for 1 month of the year for annual road maintenance. Water is required during road maintenance for the grading and re-compacting of the roads, which uses approximately 32kℓ/km of road.

Several water header tanks will be used to provide water for the construction phase. Water will be sourced from boreholes on the property, or from the municipality or neighbouring farmers (under agreement) and trucked to site as required during the construction and operational phases. Recent (July 2021) borehole drilling and pump-testing on the project site has confirmed the availability of sustainable ground-water yield, and the Proponent has applied to the DHSWS for the requisite authorisation to abstract water from the project site. Potable (drinking) water will be sourced from the same groundwater source, the local Municipality or alternatively bottled water will be provided for drinking purposes during construction and operations.

Basic sanitation will be provided on site during the construction and operational phases in the form of portable toilets and conservancy tanks. Wastewater will be collected at regular intervals and transported to the Municipal Wastewater Treatment Works or other suitable treatment facility.

Electricity for construction could be obtained from temporary diesel generators and possibly small scale mobile photovoltaic units.

The Hantam Municipality currently has four active general waste landfill sites, located at Calvinia, Brandvlei Nieuwoudtville and Loeriesfontein and five sewage treatment plants. Please note however that the Applicant cannot commit to a specific waste treatment facility at this stage for solid waste or wastewater. This can only be confirmed closer to the time of construction, once the Contractor has been appointed, and based on the capacity at the waste disposal/treatment sites at the time of construction.

Temporary Site Camp and Laydown Area

For the duration of the construction phase, a temporary site camp and laydown area/s will be required. Three construction laydown areas of up to 15ha 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, depending on the Construction Contractors

requirements and depending on whether concrete will be batched on-site or not. The laydown areas would include temporary site offices, stores, concrete batching area, workshops, turbine storage areas, fuel storage, worker mess and ablution facilities etc. These areas would be rehabilitated after construction. The total area will equate to approximately 45ha which will temporarily be disturbed. These temporary site camp and laydown areas must be kept appropriately fenced (where required) and secure for the duration of the construction period, as valuable items and materials may be stored. The site camp will also be used for the storage of hazardous materials and tools and measures to ensure the appropriate management of these have been considered in the EMPr (Annexure F).

The construction site camp will also be the central meeting point for the various construction workers and therefore social interactions and behaviour form an important role when considering the environmental management. Should worker accommodation be required on site, it will likely be located at the site camp as well. Measures have been included in the EMPr to appropriately encourage environmentally responsible measures, such as limiting pollution, littering, and reducing the risk of starting fires, etc.

The laydown area, located adjacent to the construction site camp, will be used for the storage of material components. The large components associated with the turbines themselves will be stored at the hardstands to reduce additional transporting.

The construction site camp and laydown area/s will be established in accordance with the provisions for the establishment of such areas as detailed in the EMPr.

Permanent Operations and Maintenance Facilities

Permanent Operations and Maintenance (O&M) Facilities will be developed. A 5ha area has been identified for the substation and Operational and Management (O&M) complex. The following infrastructure would be located within 5 ha area:

- Facility substation (approx. 1ha)
- O&M building (approx. 0.5 ha)
- Oil storage area (less than 30m^3) (approx. 0.1 ha)
- Battery Energy Storage Facility (approx. 2 ha)
- Associated facilities including the parking area

5.1.3 Project Phases

The project lifecycle of the proposed Kokerboom 3 Wind Farm will consist of four significant phases, namely Pre-Construction, Construction, Operation and Decommissioning. The following subsections provide detail on the activities that are associated with each of these phases, and are followed by Table 5-4 which summarises key activities, and associates them with each of the triggered EIA activities identified in Section 0.

5.1.3.1 Pre-construction Phase Activities

Pre-construction activities involve tasks that establish the site, both in terms of the construction activities, as well as the social and environmental management systems. During this time, all effort should be made to ensure that the planning of the project is completed effectively to ensure that there are no delays to the project and that no unnecessary environmental degradation occurs.

During this period, the final site layout will be surveyed and pegged in accordance with the authorised layout. The footprint boundaries will be demarcated, and no-go areas will be identified. Site preparation will occur for the formal laydown areas, turbine footprints, access routes, construction camps and on-site substation. Storage areas for materials and spoil and topsoil piles should be identified.

Within the formal laydown area, a maintenance and storage building along with a guard cabin will be established for the duration of the construction period. Smaller manageable components of the turbines will be placed within the laydown area, whereas larger more cumbersome structures, such as the blades, will likely be taken directly to the assembly point.

A significant percentage of the wind turbine components are likely to be imported into South Africa. Thus, the origin of the transportation routes to site would start at one of the ports in Southern Africa (most likely Saldanha or Coega). Fortunately, the nearby Loeriesfontein and Khobab Wind Farms started construction in May 2015 and as such the routes have been tested. A transport assessment was undertaken by Zutari and is included in Annexure D. The findings are briefly described in Chapter 6 below (nuisance impacts), and recommendations are included in the Environmental Management Programme (EMPr) in Annexure F. The transportation plan would be finalised during the pre-construction phase, and all necessary transportation permits obtained from the relevant roads authority/ies.

It is also important to ensure that social risk is insured during the construction period by ensuring that an appropriate grievance mechanism is in place. Furthermore, all the Contractors' staff must undergo environmental awareness training to ensure they understand the environmental sensitivities of the site.

5.1.3.2 Construction Phase Activities

The construction period for the Kokerboom 3 Wind Farm is anticipated to last 18 – 24 months. During this phase, environmental degradation will be limited to the certain necessary areas. A construction camp will be fenced off and will include a site office, storage areas as well as areas for the management of dangerous and hazardous substances such as fuel and waste materials.

At the start of the construction period, access roads to the site and between the turbines will need to be established. Where possible, existing farm roads will be used and upgraded. The roads will be approximately 8 m wide and will be surfaced with imported gravel wearing course material or other suitable material. Some internal access roads may need to be widened up to 20m wide during the construction phase, to accommodate the transport of turbine components and large machinery to the turbine sites, and cable trenching and stockpiling activities. These internal haulage roads will be rehabilitated down to 8m after construction is complete, or rehabilitated completely if the haulage road will not be required as an access/ service road during the operational phase.

The areas identified for construction works will require vegetation to be cleared. It is important for successful rehabilitation of the site, that topsoil be separated and stockpiled for future use. Measures to manage the stockpiles and quantities of topsoil are included in the EMPr (Annexure F).

At each turbine site, there will be a hardstand area of up to 150 m x 100 m and a laydown/assembly area of ~150 m x 15 m. 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). The exact position and orientation of the hardstands and laydowns will be determined during the detailed design stage.

The turbines will be assembled in sections as illustrated in Figure 5-6. The crane hardstand will remain in place for the duration of the operational phase, to facilitate maintenance of the turbine and eventual decommissioning.

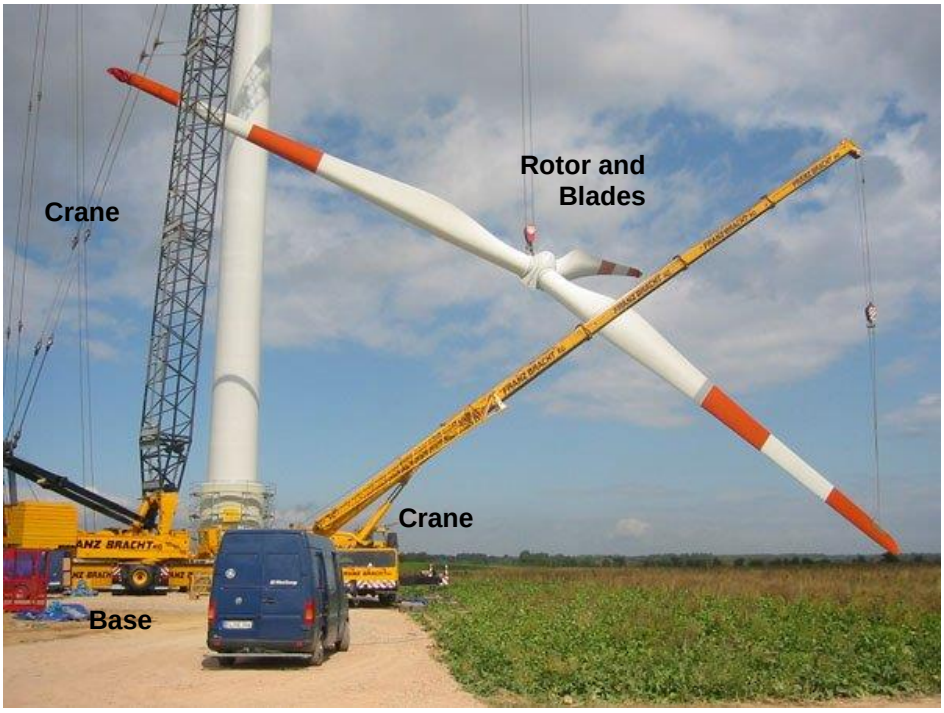


Figure 5-6 | Wind turbine in the process of being assembled

Potential waste streams during construction will include general site waste and spoil (some of which can be reused). Bins will be placed at suitable locations within the construction camp and a waste management hierarchy (reduce, reuse recycle) will be required as a condition of the EMPr. Approximately 280,000 m^3 of spoil will be generated for Kokerboom 3 Wind Farm, of which approximately 200,000 m^3 can be reused as part of the construction activities, the remaining 80,000 m^3 will be removed from site and re-used elsewhere (if feasible) or delivered to an appropriate recycling facility or registered municipal landfill facility. Waste mitigation measures are included in detail in the EMPr (Annexure F).

Rehabilitation during the construction phase will be undertaken in a phased approach and will continue into the operational phase.

The construction phase is expected to extend over a period of 18 months and create approximately 300 employment opportunities. It is anticipated that approximately 60% (180) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (90) to semi-skilled workers (drivers, equipment operators etc.) and 10% (30) for skilled personnel (engineers, land surveyors, project managers etc.). The majority of the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Loeriesfontein and potentially Niewoudtville, Calvinia and other nearby settlements. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. In order to maximise the potential benefits, the developer should commit to employing local community members to fill the low and medium skilled jobs, as far as possible.

5.1.3.3 Operational Phase Activities

Turbines are designed to operate continuously, unattended and with low maintenance for more than 20 years or greater than 120,000 hours of operation. Once operating, the proposed wind turbines will be monitored and controlled remotely, with a mobile team brought to site for maintenance, when required. Approximately 35 permanent jobs would be available during the operational phase, made up of 25 highly skilled, five skilled and five unskilled positions. There would be basic operation and maintenance buildings including a storage facility, site office and workshop area. The temporary construction site camp from the construction phase will however be decommissioned and included in the rehabilitation of the area.

The wind farm will be monitored and controlled remotely using telemetric systems. This will enable the operator of the wind farm to monitor activity on site remotely, as well as the performance of the turbines and make adjustments to ensure optimum performance of the facility. Should there be a security threat or if there is an equipment malfunction, personnel will be deployed to attend to the situation on an *ad hoc* basis.

During the operational phase the site will remain available to the farmers as rangeland or retained as wilderness area. The areas disturbed during the construction phase will be rehabilitated in a phased approach during this operational phase.

A post construction monitoring programme for birds and bats will also continue into the operational phase.

The proponent intends to apply for an Independent Power Producer (IPP) contract in an upcoming bid round of the Department of Energy's (DoE) *Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)*. Construction of the WEF is expected to commence within 4-6 months of being selected as a preferred bidder.

5.1.3.4 Decommissioning Phase Activities

The proposed project has an intended project lifespan of approximately 20 years, based on the mechanical characteristics of the turbines, and the fact that a maximum of a 20-year power purchase agreement can be signed with Eskom under the REIPPPP programme. At the end of the 20-year operational phase, the lifespan of the Kokerboom 3 Wind Farm may be extended (subject to the necessary authorisations and agreements with the landowners, Eskom and the DoE), in which case the turbines may be refurbished, upgraded or replaced with the latest turbine technology at the time. Alternatively, should the lifespan of the Kokerboom 3 Wind Farm not be extended beyond the 20-year operational phase, then the wind farm will be decommissioned.

The decommissioning period is likely to be similar to that of the construction period (Section 5.1.3.2) and the associated impacts (detailed in Chapter 6) are therefore likely to be similar. The decommissioning is expected to take between 12 to 18 months. After disconnecting the wind farm infrastructure from the electricity network, the wind farm components would be disassembled, removed and reused or recycled as far as possible. All underground cables would be excavated and removed or left *in situ* if appropriate. The buildings and associated infrastructure would be demolished and removed by an authorised company.

The rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). The prescribed restoration activities are described in the EMPr.

5.1.3.5 Summary of Activities Associated with Each Project Phase

The following table provides a summary of the descriptions of each activity within the relevant project phase. The listed activities detailed above in Table 5-4

Table 2-2 in terms of NEMA have been assessed for each of the project activities as indicated in the third column of the table.

Table 5-4 | Summary of activities associated with each project phase

Activity title	Description of activity	NEMA triggered activity
Pre-construction Phase		
Site layout finalisation	• All pre-construction authorisations processed. • Detailed design, surveying and pegging of approved layout.	GN R983, Activity 28
Proactive social measures	• Establish grievance mechanism. • Construction team training.	N/A
Construction Phase		
Site clearance and layout	• Laying out of construction site and footprint • Fencing and demarcating site boundaries • Vegetation clearance • Increase in traffic	GN R984, Activity 15
Management of construction camp	The temporary construction camp will be an area demarcated for the contractor and his employees. This area will include areas for storage of materials, disposal points for waste, shelter, lighting, eating areas, ablution facilities, etc. Appropriate management of this area may reduce the potential for behaviour that may harm or degrade the environment (biophysical and social) to be avoided for the duration of this development.	N/A
Construction of Roads	Access roads to the site and between the turbines will need to be established. Where possible, existing farm roads will be used and upgraded. These will be required to cross drainage lines.	GN R983, Activity 12, 19, 24 and 56 GN R985, Activity 18
Construction of wind turbines	• Excavate foundation • Create hardstand for crane during assembly process • Assemble tower • Assemble nacelle and blades	GN R984, Activity 1
Construction of transmission distribution infrastructure	• Construction of on-site substation and transformer • Provision of cabling for medium voltage lines (33kV) • Connection to substations and internal transmission lines	GN R983, Activity 11, 12, 19
Rehabilitation of construction period	Site rehabilitation should be undertaken in a phased approach so that areas do not remain disturbed for too long, and so that rehabilitating areas are not disrupted. This will carry on into the operational phase.	N/A
Operational Phase		
Generation of electricity	• Renewable energy will be generated and fed into the national grid. • Facility will make use of water and electricity	GN R983, Activity 28 GN R984, Activity 1

	• Post-construction bird and bat monitoring will occur as per the conditions in the EA	
Maintenance	Maintenance activities will be required during the operation of the wind farm. This may include actions as large as replacing parts on the turbine which will require the use of the crane, as well as road maintenance/grading.	N/A
Decommissioning Phase		
Generation of electricity ceases	Should the Kokerboom 3 Wind Farm no longer be necessary (likely only after 20 years), the infrastructure will be decommissioned.	N/A
Disassembly of components	All components that are no longer needed on site shall be disassembled and removed from site. Where possible, components will be reused. In most cases, they will require appropriate waste management.	N/A
Site rehabilitation	The aim would be to restore the land to its original substratum characteristics (or as near as possible).	N/A

5.2 Need and Desirability of the Project

The 'need and desirability' of the project should be evaluated against the strategic context of the development proposal along with the broader societal needs and the public interest. Wind energy is desirable as it:

- Creates a more sustainable economy by promoting South Africa's energy policy towards energy diversification;
- Reduces the demand on scarce resources such as water by promoting energy generating facilities which are less resource intensive;
- Assists in meeting nationally appropriate carbon emission targets in line with global climate change commitments by reducing reliance on coal as an energy source;
- Reduces and, where possible, eliminates pollution by using cleaner energy generating mechanisms and reducing the demand on carbon-based fuels;
- Promotes local economic development by creating jobs and promoting skills development; and
- Enhances energy security by diversifying generation to reduce reliance on coal, which is non-renewable, as a primary energy source and promoting renewable energy generation

According to the DEA Guideline on Need and Desirability (DEA, 2010[6]), the concept of 'need and desirability' relates to the nature, scale and location of development being proposed, as well as the wise use of land. The concept of 'need and desirability' can be explained in terms of the broader meaning of its two components, need primarily refers to time, and desirability refers to place. It is acknowledged that 'need and desirability' are interrelated and the two components collectively should be considered in an integrated and holistic manner.

According to the DEA Guideline (DEA, 2010), the strategic context for the need and desirability of an activity can be reviewed in light of what is envisioned for a specific area, specifically what has been proposed in a municipal Integrated Development Plan (IDP) and Spatial Development Framework (SDF). These planning tools provide direction as to the desired spatial form of a municipality. Similarly, municipal Environmental Management Frameworks (EMFs) also provide the desired spatial form in terms of the environmental context of an area. Furthermore, the DEA Guideline (DEA, 2010) states that the need and desirability of an activity

[6] DEA. 2010. Guideline on Need and Desirability, Integrated Environmental Management Guideline Series 9, Department of Environmental Affairs (DEA), Pretoria, South Africa.

should be evaluated against the principles of "*promoting justifiable economic and social development*" as well as the principles of "*securing ecological sustainable development and use of natural resources*" as set out in the bill of rights in the Constitution.

The project specific responses to questions included in the Needs and Desirability Guideline[7] are set out in Table 5-5 below.

Table 5-5 | Need and Desirability of the proposed Kokerboom 3 Wind Farm

Need and Desirability	
Need (Timing)	
Question	**Response**
1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority i.e. is the proposed development in line with the projects and programmes identified as priorities within the Integrated Development Plan (IDP)?	Renewable Energy projects have been prioritised in strategies at various municipal scales in the area. The Northern Cape Province aims to provide a "home" for Renewable Energy[8]. The Namakwa District Municipality (DM) aims to "enable development around the construction of the 100 MW wind farm[9]". This would suggest that the site for Kokerboom 3 Wind Farm would be supported by the DM. The Namakwa SDF identifies a number of major infrastructure projects, which includes "the promotion of domestic and large-scale solar energy usage and projects such as wind and solar farms subject to appropriate guidelines and siting principles". The plan specifically lists wind and solar farm siting principles based on slope, geology, soils, surface hydrology, ground water and vegetation. The Hantam Local Municipality (LM) specifically includes the importance of renewable energy in the 2015 to 2020 development plan indicated in the 2020/2021 IDP. Apart from providing the business plans for attracting renewable energy projects to the area, the IDP also includes strategies relating to PPP and raising public awareness on green energy and energy saving, as well as climate change awareness programmes. The area proposed is currently zoned as Agricultural land. The respective landowners have signed an option for a long-term lease agreement with the Proponent. The leased land has very low agricultural potential and grazing could continue below the turbines and as such it would not negatively affect the economic viability of the farm. Participating landowners would receive a percentage of the revenue from the wind farm, and this additional income would safeguard the economic sustainability of the farms.
2. Should development, or if applicable, expansion of the town/ area concerned in terms of this land use (associated with the activity being applied for) occur at this point in time?	Yes. The Hantam LM has identified renewable energy projects as one of its strategies going forward. Similarly, the Namakwa DM has identified renewable energy in their programme of action. The area is currently being designed to be an area of excellence for renewable energy (provided the projects are implemented). This is well suited given the need for clean energy in South Africa, and the low agricultural potential of the land on which this project is proposed.

[7] DEA&DP. 2011. Needs and Desirability Guideline.
[8] Northern Cape Department of Economic Development and Tourism. 2012. Northern Cape Province Economic Potential and Investment Profile.
[9] It is assumed that this refers to the 140 MW Loeriesfontein Wind Farm and/or the 140MW Khobab Wind Farm as both sites were selected as preferred bidders in bidding window three of the REIPPPP. Construction of Loeriesfontein Wind Farm began in May 2015, as did the construction of Khobab Wind Farm.

3. Does the community/ area need the activity and the associated land use concerned (is it a societal priority)?	Yes. The Hantam LM has identified the need to speed up economic growth and transform the economy in a sustainable manner and to provide a programme to build economic and social infrastructure. According to the 2020-2021 Integrated Development Plan (IDP) the LM aims to raise public awareness on green energy and energy saving. The Loeriesfontein ward region is a very arid region of the Northern Cape where agricultural potential is very low. Sheep farming forms the predominant land use and large expanses of land are required for grazing. Large farms (exemplified by those on which this project is proposed) hold little to no economic opportunity for the farmers with little access to water. During an interview with one of the affected landowners, the socio-economic specialist identified that many of the farmers are unable to employ farm workers permanently, and generally only employ seasonal workers for sheep shearing. The proposed Kokerboom WEF would therefore directly benefit the local community. Firstly, it would be a source of income to the landowner and would improve the economic viability of the landowner's current farming operations. Secondly, it would also create direct and indirect job opportunities for the local community. Secondary economic benefits may include an increase in service amenities through an increase in contractors and associated demand for accommodation and other services.
4. Are there necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	The services required for the development of the proposed Kokerboom 3 Wind Farm would include appropriate road access to the site; an appropriate connection to the national grid; access to water and disposal of different waste streams for the construction period; as well as associated services supplied from the local towns (accommodation, etc.). The construction of the Loeriesfontein and Khobab Wind Farms has led to the upgrade of the roads in the area to facilitate the movement of abnormal loads. These construction periods will have also increased the demand from secondary services from the local towns. The capacity of the municipal water and waste streams will need to be determined prior to construction. Construction of this project may only begin in more than two years, if the project is granted all authorisations and selected as a preferred bidder in terms of REIPPPP. Appropriate waste disposal site/s with sufficient capacity to accept the project's waste will be identified closer to the time of construction. Appropriate water sources for construction and operational activities will be identified closer to the time of construction, and the necessary approvals obtained (where required).
5. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placements of services)?	Yes. Although the project is not specifically mentioned in the municipal planning reports reference is made of wind energy projects and the need to upgrade infrastructure to accommodate renewable energy developments. The Hantam LM IDP (specifically ward 5 (Loeriesfontein)) identifies the need for the paving of roads, identification of new water sources, promotion of renewable energy, awareness on biodiversity and improved engagement through PPP. The EIA process of this project can assist with the above needs through an increase of scientific assessment in the area. Water, sanitation and electrical services required for the construction and operation of the WEF will be provided by the appointed contractor, and

	additional municipal services are not expected to be required for the proposed development (e.g. potable water will be trucked to site, or obtained from the property, waste water will be collected in conservancy tanks and transported to an appropriate wastewater treatment site, on-site generators will be utilised etc.). Should municipal services be required, these will be confirmed and agreed with the municipality prior to commencing. Should the municipality be unable to provide the necessary services, then the applicant (or their appointed contractor) will be responsible for providing the necessary services to the site via use of private service providers.
6. Is this project part of a national programme to address an issue of national concern or importance?	Yes. The establishment of the proposed facilities would strengthen the existing electricity grid for the area. Moreover, the project would contribute towards meeting the national energy targets as set by the DoE, of a share of all new power generation being derived from IPPs. The 2010 Industrial Policy Action Plan recommends a sector focussed approach identifying key sectors with potential to be developed. The sectors identified in the IPAP2 document include green energy saving industries especially wind. The proposed WEF thus further facilitates the realisation of this development objective. The 2010 Integrated Resource Plan (IRP) developed by the DoE for the 2010 to 2030 period aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*". The final IRP provides for an additional 20,409 MW of renewable energy in the electricity mix in South Africa by 2030.
Need and Desirability	
Desirability (Placing)	
Question	**Response**
1. Is the development the best practicable environmental option for this land/ site?	Yes. The Loeriesfontein ward of Hantam LM is a very arid region of the Northern Cape where agricultural potential is very low. Low intensity sheep farming forms the predominant land use. The WEF will allow *status quo* farming activities to continue once the facility is in operation and after it has been decommissioned. As detailed below in Chapter 6, very few environmental aspects have been identified as sensitive. The proposed Kokerboom 3 Wind Farm is also located near the existing Eskom Helios Substation and therefore major distribution infrastructure is already in place. The Kokerboom wind farm is proposed directly adjacent to the Loeriesfontein and Khobab Wind Farms and there are environmental and economic benefits to concentrating renewable energy developments in one location, rather than spreading such developments over a larger portion of the landscape. Furthermore, the landowners derive little income from their existing farming practices, and very few jobs are created. Placing the WEF on this site would allow the farmers to earn a larger income and would also provide job opportunities to the surrounding community.
2. Would the approval of this application compromise the integrity of the existing approved Municipal IDP and SDF as agreed to by the relevant authorities?	No. The project is in line with the Hantam LM IDP which recognises the need for the development of renewable energy. The Namakwa DM IDP further identifies renewable energy in their programme of action as an area of economic development. The Namakwa DM SDF identifies the spatial

	planning category for the area as an 'extensive agricultural area (grazing) and the proposed wind farm will allow this land use to continue between the turbines during operation of the facility'.
3. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in Environmental Management Frameworks (EMFs)), and if so, can it be justified in terms of sustainability considerations?	The application will not compromise existing environmental management priorities for the area. The Namakwa LM EMF (2011) shows that the study area is in an area of very low or medium sensitivity which is mapped at a broad scale. Furthermore, ground-truthing by the terrestrial ecologist has resulted in a sensitivity map of the site as depicted in Figure 6-5 (mostly medium-low (moderate-minor) sensitivity). The turbine layout has been designed to avoid the areas of higher sensitivity as identified in the sensitivity map.
4. Do location factors favour this land use (associated with the activity applied for) at this place?	Yes. Suitability of the site includes the wind resource and it's characteristics measured throughout the year; the availability of grid capacity to evacuate power from the WEF into the national grid; the proximity to national grid; the accessibility of terrain from a construction and access perspective; the topographical features; the low agricultural potential of the site; the support of the landowners concerned; the avoidance of environmental sensitivities as well as various economic considerations which include the feasibility of the project in terms of financial and technical perspective.
5. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)?	The impacts on the natural and cultural areas have been assessed in Chapter 6 and it has been found that the potential impacts affecting sensitive natural and cultural areas can be mitigated to a negligible (-) significance. The site layout has been specifically designed so as to avoid the limited sensitive areas on site as far as possible.
6. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	The socio-economic impacts have been assessed in Chapter 6 and it has been found that although the visual impacts are anticipated the visual statement is still in support of the development at this location, due to the remoteness of the site and the presence of other renewable facilities and electrical infrastructure already in place. The SIA has identified several positive impacts that will significantly benefit the local community, most notably the benefits associated with the establishment of a Community Trust and the creation of direct and indirect employment opportunities. Due to limited sensitive receptors in the area, the nuisance impacts are anticipated to be low or very low in significance.
7. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	No. The farm portions are currently only experiencing very low agricultural activity. Furthermore, due to the remote location of the property, it is not likely that it would be earmarked for any other development (other than renewable energy). The status quo farming activities will continue once the facility is in operation and after it has been decommissioned.
8. Will the proposed land use result in unacceptable cumulative impacts?	Potential cumulative impacts associated with the proposed project have been assessed in the respective specialist studies (Annexure D) and are discussed in Chapter 7. Whilst negative cumulative impacts are expected, none are considered unacceptable. Positive socio-economic cumulative impacts are also anticipated, and with the appropriate implementation of the renewable energy developments will potentially be high positive significance.

In summary, the 'need and desirability' for the proposed wind farm is considered substantiated in its current location near Loeriesfontein in the Hantam Municipal Area where high wind resources avail and agricultural potential and environmental sensitivity is low. This is coupled by the fact that wind energy developments are a reaction to national policy discourse as an alternative to fossil fuels and provided for by specific policy

instruments. They are also the subject of local focus areas for economic development. The socio-economic impact assessment has found that the project would bring economic benefits to the local community and would outweigh the potential negative impacts, for which adequate mitigation measures have been provided. This impact assessment is detailed below in Chapter 6.

In terms of alternatives, the desirability of the location of the site has been discussed in Table 5-5 above. The design and layout alternatives have been directly influenced by the environmental sensitivities of the site and infrastructure has been proposed in specific locations to avoid these sensitivities, as far as possible. (This layout is provided in Figure 6-1.) Due to the rate of advancement in turbine technology, no turbine model alternatives have been considered in this report. This assessment, including all specialist studies, have considered the worst-case scenario in terms of turbine dimensions and properties (e.g. the noise impact assessment was based on the nosiest turbine known to be available in SA). This assessment has also considered a range of turbine dimensions up to a maximum tip height of 240m, with a hub-height of up tp 150m and rotor diameter of up to 180m each. The preferred turbine will be selected based on the most suitably available technology at the time and will fall within the parameters assessed in this EIA. As discussed in Table 5-5 above, the opportunity costs are not considered to be unacceptable due to the low agricultural potential and remote nature of the site.

6 BIOPHYSICAL AND SOCIO-ECONOMIC IMPACT ASSESSMENT

As described in Section 3.1.2 several environmental aspects were identified during the Scoping Phase that may be impacted upon by the proposed Kokerboom 3 Wind Farm and associated infrastructure. During the Scoping Phase, sensitive areas were mapped for each environmental aspect and were provided to the Proponent and engineering design team. The environmental sensitivities were then avoided as far as possible in the placement of the turbines and associated infrastructure during this EIR phase. The mapped sensitive areas superimposed by the proposed project layout is illustrated on the following page in Figure 6-1.

Several impacts (positive and negative) specific to the proposed Kokerboom 3 Wind Farm have been identified and assessed by both the EAP and relevant specialists in this chapter. Potential cumulative impacts caused by the Kokerboom 3 Wind Farm in addition to other renewable energy projects in the area (within a 30km radius) are assessed in Chapter 7.

For each impact assessed, mitigation measures have been proposed to avoid, reduce (negative) or enhance (positive) the impacts. These mitigation measures have also been incorporated into the lifecycle EMPr to ensure that they are implemented during the pre-construction, construction, operational and decommissioning phases. The EMPr forms part of the EIR (Annexure F), and as such, its implementation will become a binding requirement should this project be authorised.

The following environmental aspects are further described in the following subsections:

- Terrestrial ecology (excluding birds and bats);
- Bats;
- Avifauna (birds);
- Aquatic ecology;
- Heritage (including archaeology);
- Socio-economic;
- Nuisance impacts (noise, dust and traffic);
- Visual landscape;
- Electromagnetic and radio frequency interference and
- Transport

For each of these sections, a brief introduction will be provided giving context to the study. This will be followed by a description of the current environment, building on what was identified during the Scoping Process. An assessment has been undertaken for each impact assessed within the context of the environmental aspect, which has been presented in a table format, linking the proposed mitigation measures to each impact. Following this, the no-go alternative is discussed. In conclusion to each environmental aspect, an impact statement is presented, which provides a summary of the nature of the impacts and the mitigation measures recommended to reduce the impacts associated with each environmental aspect. By understanding these associations, it is possible for the DFFE to ensure that appropriate impacts have been assessed, and suitable mitigation measures recommended, resulting in a robust EIA process.

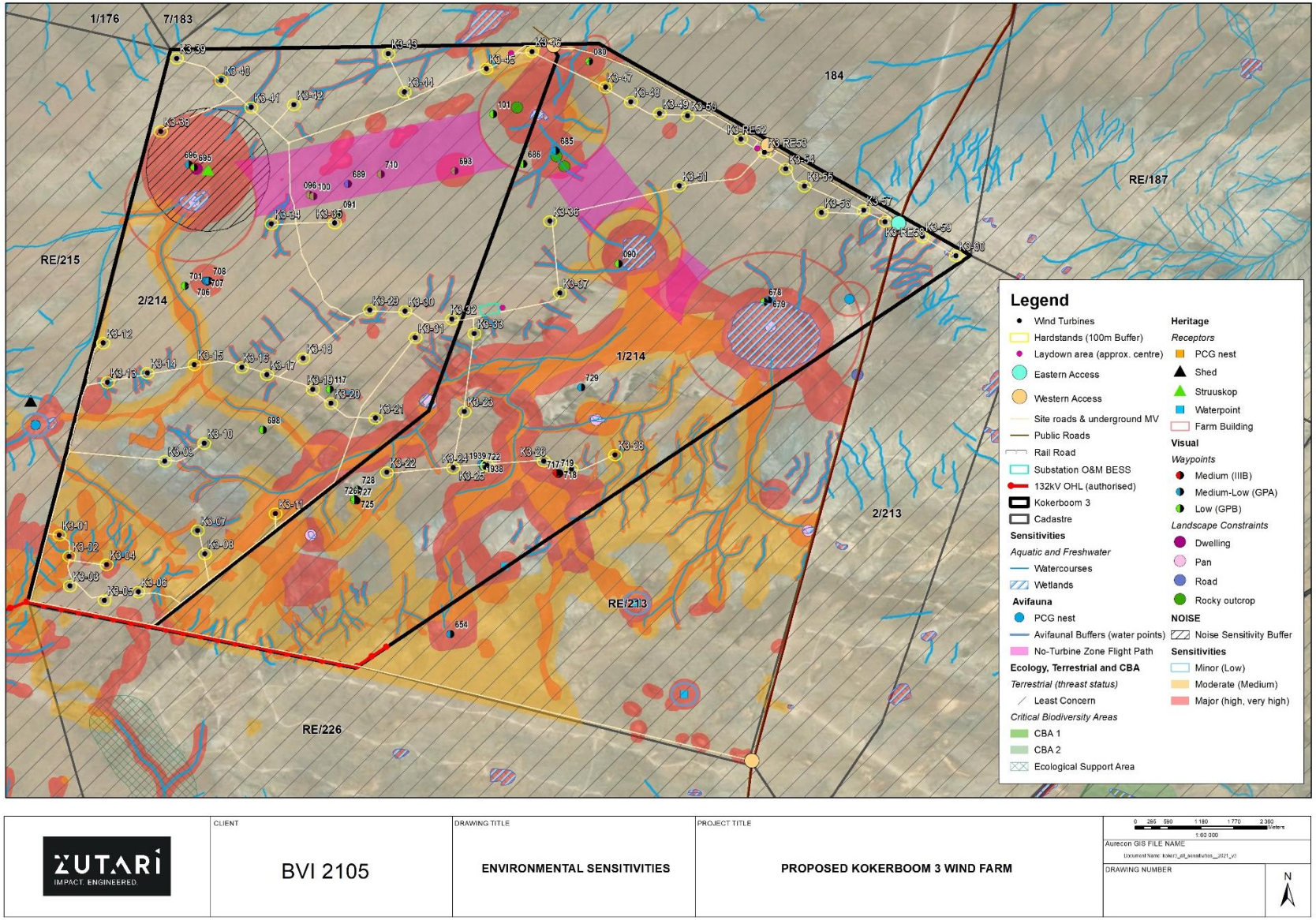


Figure 6-1 | Proposed layout for Kokerboom 3 Wind Farm and associated infrastructure superimposed over mapped environmental sensitivities

6.1 Terrestrial Ecology (excluding birds and bats)

As described above in Chapter 5, the construction of the proposed Kokerboom 3 Wind Farm and associated infrastructure will require approximately 175.6ha of land to be temporary disturbed. Whilst some of the degradation will be rehabilitated, approximately 168.2ha will be permanently transformed. The loss of this natural vegetation and groundcover has the potential to impact the ecological systems and processes that currently exist. It was therefore deemed necessary to investigate the *status quo* and potential impacts that the wind farm may pose on the biophysical environment. This section therefore assesses the impact of the Kokerboom 3 Wind Farm on the terrestrial ecology of the area which includes the floral and faunal components of the environment. Bats (Section 6.2) and birds (avifauna) (Section 6.3) have been excluded from this section and are dealt with separately due to the direct impacts they experience from WEFs. Aquatic ecology has also been considered separately in Section 6.4.

Dr Brian Colloty of EnviroSci, was appointed to undertake a fauna and flora specialist impact assessment for the proposed Kokerboom 3 wind farm and associated infrastructure. Dr Colloty's study has been informed by his extensive experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, and estuarine and wetland delineation throughout Africa.

Prior to this assessment phase, specialists were commissioned to assist with the design and placement of the turbines and internal roads, through the identification of sensitive features and constraints in a screening or constraints assessment. This provided input into the design process, allowing the Applicant to avoid and or minimise potential impacts by aligning the layout accordingly prior to the commencement of the formal Environmental Impact Assessment process, i.e. prior to the Scoping and EIA phases.

During the screening assessment, a four-day site visit of the area was conducted in May 2020, in which the habitats / species listed above were considered, together with a description of the general environment and species assemblages found present. This spatial data was then supplied to the Applicant to develop the layout outside of these areas (inclusive of suitable buffers) as a mechanism of impact avoidance using fine scale mapping data. The study area had received some much needed winter rainfall, which aided in critically assessing the ecological character of the site, with particular reference to any linkages between the aquatic and terrestrial environment as indicated in the Screening Tool Results (ESA & NFEPA). The information collected, was also compared to previous assessments undertaken within the region by members of EnviroSci, the results of which were used in the assessment of the wind farms that have already been completed in the region. A second site visit was then conducted in June 2021 to assess the layout contained in this report, to ground truth the potential layout according to the sensitivity layers presented. More detail on the methodology undertaken for the study can be found in Dr Colloty's specialist report in Annexure D.

6.1.1 Description of the environment

6.1.1.1 Vegetation

The region is characterised by irregular plains, either bisected by shallow alluvial water courses or Endorheic Pans and Depressions, that vary in size. The site is underlain with a rocky to sandy substrate derived from Mudstones and Shales from the Ecca Group and Dwyka Tillites. The area is thus characterised by very shallow soils, mostly with limestone/calcrete present. Dolerite outcrops varying in size are also present (Mucina & Rutherford, 2007). Dolerite outcrops varying in size are also present (Figure 6-2).

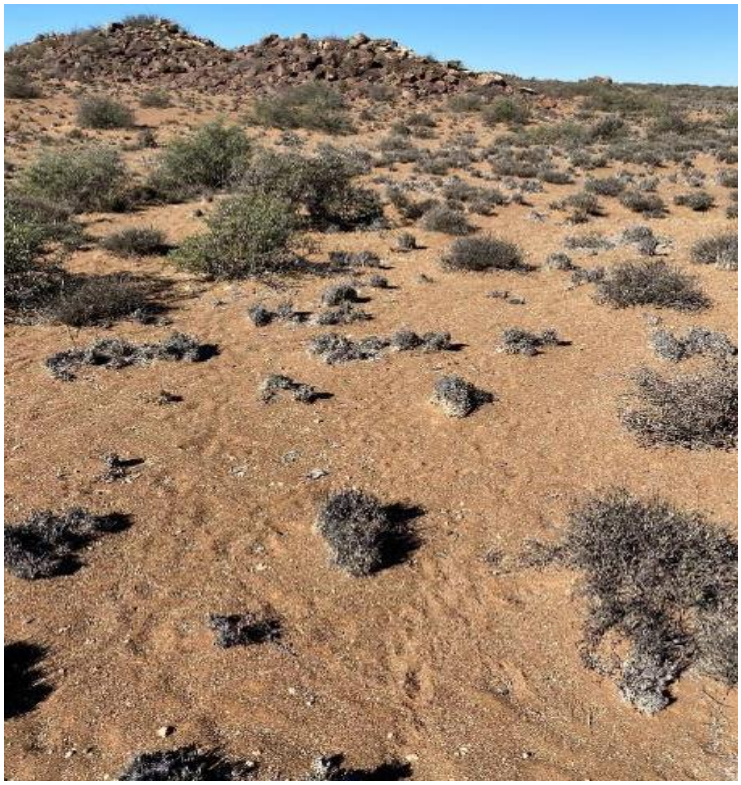


Figure 6-2: A view of one of the larger dolerite outcrops, with spoor evidence of animal use (tracks) between outcrops

According to the National Vegetation Type Map (Mucina & Rutherford, 2007, updated in 2017/2018), the site is primarily located within Bushmanland Basin Shrubland (NKb 6) (Figure 6-3). This vegetation unit is dominated by dwarf shrubs, usually succulents, with grasses scattered. Apart from alien Prosopis trees, no indigenous trees were found on the site. A secondary vegetation unit, associated with the large pans was also found within the site, namely Bushmanland Vloere (Azi 5). The Bushmanland Basin Shrubland and Bushmanland Vloere vegetation types are not listed as a Threatened Ecosystem as per the National Environmental Management Biodiversity Act, this is due to the vast area this vegetation units occupy, with little in terms of human / agricultural use.

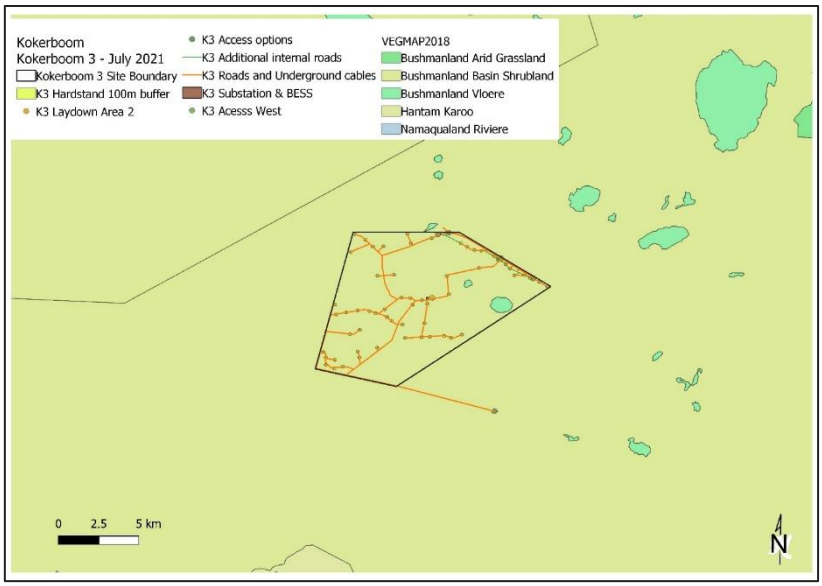


Figure 6-3 | Project locality map indicating regional vegetation types as per the National Vegetation Type map updated 2017/2018

The DFFE Screening Tool lists Plant Species 44, which was actively searched for, but suitable habitat and or the presence / absence of this species was not confirmed.

Based on the number, density and type of species observed within the site, it was clear that four sperate habitat units were observed. These included the following:

- Shale / calcrete dominated plains (Refer Figure 6-4) with succulent plant species such as *Brownanthus ciliatus, Euphorbia decussata, Prenia tetragonia, Ruschia robusta, Zygophyllum retrofractum, Lycium pumilum, Aridaria noctiflora, Sceletium tortuosum, Phyllobolus nitidus, Cephalophyllum rigidum Drosanthemum lique, Octompoma quadrisepalum, Ruschia abbreviata, Galenia fruticosa, Exomis microphylla, Tetragonia fruticosa, Tripteris sinuate.*
- Low lying drainage lines and alluvial watercourses, that were dominated by sandy alluvial with or without distinct channels that contained larger and more abundant herbaceous shrubs and grasses than the flat stony / shale plains. Plant species included*, Phaeoptilum spinosum, Zygophyllum retrofractum, Salsola tuberculata, Rhigozum trichotomum, Stipagrostis namaquensis, Osteospermum armatum, Lycium pumilum, Lycium oxycarpum, Stipagrostis obtuse, Galenia sarcophylla*, *Salsola aphylla and Sesamum capensis.* These areas also act as faunal corridors between the pans and Dolerite outcrops, with these three habitats containing higher numbers of animals (observed & spoor)
- Dolerite outcrops were mostly located in the northern central portion of the site and ranged from small groups of boulders to large areas of weathered outcrop of exposed rock. Plant species assemblages varied within these areas, and species assemblages reflected the adjoining habitats. It is also proposed that this the only habitat in close proximity to any of the wind farm infrastructure be buffered by 20m.
- Pans and depressions (Bushmanland Vloere vegetation unit) ranged from bare sandy areas to vegetated pans, although containing evidence that these were close to saline, i.e. dried salt crusts or saline tolerant species such as *Salsola aphylla* and *Salsola tuberculata*

Figure 6-4 | A view of extensive shale plains in the southern half of the site

6.1.1.2 Terrestrial fauna

Faunal diversity observed due to the state and size of the site was thus low, when compared to the anticipated species known to occur in the region. It is also anticipated that the invertebrate and reptile species numbers could be higher but limited by the dry conditions prior to the survey period.
No species observed on site are listed as IUCN Red Data species, but all indigenous fauna is protected under the NCNCA, i.e. provincially protected. The Butterfly assessment (Appendix 4 of the Scoping Ecological Assessment) states that the *Trimen's Opal, Chrysoritis trimeni* (identified as potentially present in the DFFE screening tool), listed as Vulnerable, will not occur within the site.

Anticipated mammal diversity was also low within the site, with approximately 40 species occurring within the region. Species observed were mostly small mammals, found on the higher lying ridges or rocky outcrop area within the site as shown in Table 6-1. No Red Data listed species were observed but do receive protection under the provincial NCNCA.

Table 6-1: Faunal species observed within the site

Taxon	Common Name	Conservation status and habitat	Site observation
Invertebrates			
Locusta pardalina	Brown locust	Least Concern	Several observed within the site
Belenois aurota	Brown veined white	Least Concern (SABCA 2013)	
Junonia hierta cebrene	Yellow pansy	Least Concern (SABCA 2013)	
Reptiles			
Dispholidus typus	Boomslang	Least Concern (ARRSA, 2014) Widespread	Observed in dense tree cover near old farmstead
Pedioplanis namaquensis	Namaqua Sand Lizard	Least Concern (ARRSA, 2014)	Rocky outcrops
Meroles suborbitalis	Spotted Desert Lizard	Least Concern (ARRSA, 2014)	Exposed shales
Nucras tessellata	*Western Sandveld Lizard*	Least Concern (ARRSA, 2014)	Rocky outcrops
Agama atra	Southern Rock Agama	Least Concern (ARRSA, 2014)	Rocky outcrops
Agama aculeata subsp. aculeata	Ground Agama	Least Concern (ARRSA, 2014)	Exposed shales
Psammobates tentorius tentorius	Karoo Tent Tortoise	Least Concern (ARRSA, 2014)	9 observed throughout the site, three suffering from severe dehydration (Plate 6)
Mammals			
Hystrix africaeaustralis	Cape Porcupine	Least Concern (RDB, 2016)	Spoor or quills evident
Orycteropus afer	Aardvark	Least Concern (RDB, 2016)	Burrows and spoor
Cynictis penicillata	Yellow Mongoose	Least Concern (RDB, 2016)	Near roads
Otocyon megalotis	Bat-eared Fox	Least Concern (RDB, 2016)	Roadkill on public road
Lepus capensis	Cape Hare	Least Concern (RDB, 2016)	Spoor
Vulpes chama	Cape Fox	Least Concern (RDB, 2016)	Spoor and observed late evening

6.1.1.3 Butterflies

The DFFE online Screening Tool identified the *Chrysoritis trimeni* butterfly species (listed as Vulnerable) as potentially occurring on the site. This butterfly has only been recorded on the northern Namaqualand coast in the Northern Cape from Noep in the south to Port Nolloth (MacDougall's Bay) in the north. It has been recorded in vegetation types SKs1 (Richtersveld Coastal Duneveld), SKs4 Richtersveld Sandy Coastal Scorpionstailveld, SKs7 (Namaqualand Strandveld) and SKs8 (Namaqualand Coastal Duneveld). It only occurs on coastal dunes in the Succulent Karoo biome.

Its recorded larval host plants at these localities are:

Thesium (species unknown) (Santalaceae)

Roepera (= Zygophyllum) flexuosa (Eckl. & Zeyh.) Beier & Thulin (Zygophyllaceae)

Roepera (=Zygophyllum) morgsana (L.) Beier & Thulin (Zygophyllaceae)

Osteospermum oppositifolium (Aiton) B. Nord. (Asteraceae)

The proposed Kokerboom development area was rated by the Screening Tool as being of "Medium" sensitivity for animals because of the possibility of the occurrence of a butterfly species of conservation concern Chrysoritis trimeni. This investigation has revealed that this butterfly could not possibly occur on the Kokerboom site, because its closest known occurrence is 250 km to the west, where it occurs in a different biome (Succulent Karoo), on coastal dunes. No other butterfly species of conservation concern have been recorded at, or in the vicinity of the Kokerboom site.

6.1.2 Impact assessment with mitigation measures

The development of the proposed Kokerboom 3 Wind Farm and associated infrastructure is likely to result in a variety of direct and indirect impacts associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure such as turbine foundations and service areas, roads, operational buildings and substations, etc. The following tables consider the potential impacts on the terrestrial ecology of the site and consider the major risk factors and contributing activities associated with the proposed development. These have been identified as:

- Direct loss of vegetation and or important habitat (-)
- Direct loss of any faunal species (-)
- Direct loss of any species of special concern (Fauna & Floral) (-)
- Increase risk of alien plant invasion (-)

Table 6-2 | Direct of loss of vegetation and or important habitats

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat, both terrestrial and aquatic. However, as the very sensitive habitats will be avoided, impacts will occur within the vegetation units found throughout the greater region. The only residual impacts are related to the limited sources of topsoil.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very Limited	
Intensity	High		Very Low	
Duration	Medium Term		Brief	
Significance	**Minor (-)/ Low**		**Negligible (-)/Very Low**	
Probability	Likely		Probable	

Confidence	High	High
Reversibility	Medium	High
Mitigation measures		
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. • Implement the Rehabilitation and Monitoring plan that forms part of the EMPr		

Table 6-3 | Direct of loss of faunal species

Phase	Pre-Construction	**Construction**	Operational	**Decommissioning**
Impact description	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat. However as the very sensitive habitats will be avoided, impacts will occur within the vegetation units found throughout the greater region. This coupled to the fact that the observed species, with the exception of the slower moving tortoises are highly mobile and will disperse to other available habitat within the region.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very limited	
Intensity	High		Very Low	
Duration	Medium Term		Brief	
Significance	**Minor (-)/ Low**		**Negligible (-) Very Low**	
Probability	Likely		Probable	
Confidence	High		High	
Reversibility	Medium		High	
Mitigation measures				
Implement the Plant and Animal Search and Rescue Plan prior to any construction activities with the requisite permits in place as supplied by DENC. This plan forms part of the EMPr.				

Table 6-4 | Direct loss of any species of special concern (Fauna &Flora)

Phase	Pre-Construction	**Construction**	Operational	**Decommissioning**
Impact description	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat. Several animals and plants observed are protected under Provincial legislation.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very Limited	
Intensity	High		Very Low	
Duration	Medium Term		Brief	
Significance	**Minor (-)/Low**		**Negligible (-)/ Very Low**	
Probability	Likely		Probable	
Confidence	High		High	
Reversibility	Medium		High	

Mitigation measures
Implement the Plant and Animal Search and Rescue Plan prior to any construction activities with the requisite permits in place as supplied by DENC. This plan forms part of the EMPr.

Table 6-5 | Increased risk of alien plant invasion

Phase	Pre-Construction	**Construction**	**Operational**	**Decommissioning**
Impact description	Currently a small number (2) of alien species was found within the site, and with disturbance coupled to the fact that plant / machinery brought to site may contain soil/debris from other sites with seed, the potential for an increased spread of alien plants is possible			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very limited	
Intensity	High		Very Low	
Duration	Medium Term		Brief	
Significance	**Minor (-)/Low**		**Negligible (-)/Very Low**	
Probability	Likely		Probable	
Confidence	High		High	
Reversibility	Medium		High	
Mitigation measures				
Implement the alien management plan, during the construction phase. The management should then continue into all future phases of the project.				

6.1.3 No-go alternative

Should the project not proceed, then current status quo with regard the terrestrial and aquatic environment would remain unchanged. Overall, the site is in a largely natural state and would remain so for an indeterminate amount of time as the natural environment already limits the extent of increased agricultural production.

6.1.4 Terrestrial ecology impact statement

The final layout was subjected to a detailed survey (walkdown) carried out in June 2021.Based on the findings and the preliminary impact assessment, the specialist finds no reason to withhold to an authorisation of any of the proposed activities, assuming that key mitigations measures are implemented. This is based on the consideration that with the exception of several minor drainage line crossings, the remaining High & Moderate Sensitivity areas can be avoided, inclusive of any buffers provided in this report. The shared southern access road will need to traverse a small depression, which is considered acceptable since this particular depression has already been impact upon by previous roads thus is already disturbed. The road between Turbine 11, 21 and 32 was realigned to avoid spanning large sections of the alluvial watercourse observed, while the footprint of Turbine 35 will avoid the rocky outcrop as per the final micro-sited layout.

The proposed layout for Kokerboom 3 is illustrated in Figure 6-5 superimposed over the areas of ecological sensitivity as identified by the specialist.

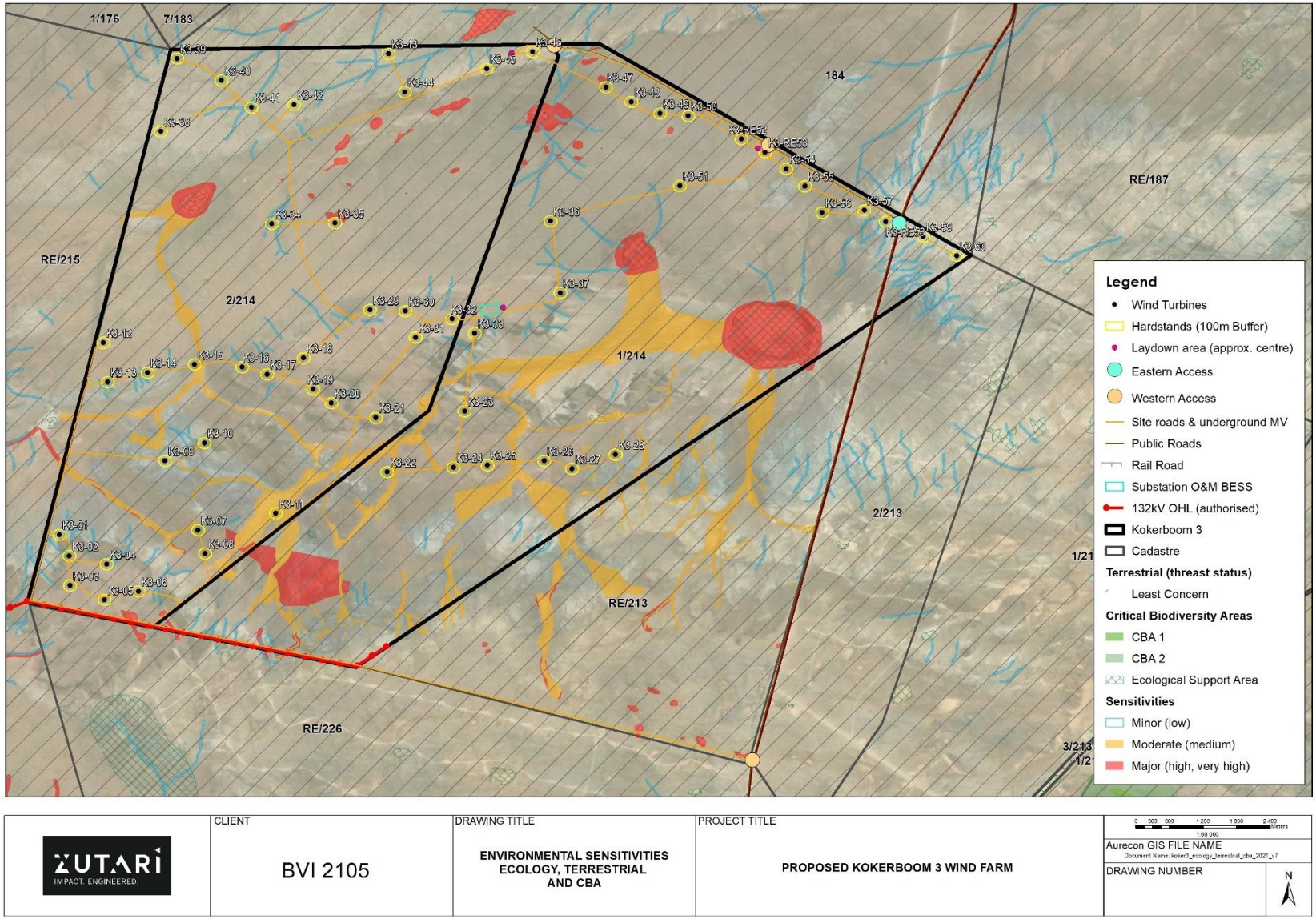


Figure 6-5 | Ecological sensitivity map for the Kokerboom 3 Wind Farm

Should the development be authorised, it is strongly advised that the mitigation measures included in the tables above should be implemented to reduce the impact of the wind farm to a low negative. Additional environmental management activities have been detailed in the flora and fauna specialist report (Annexure D) and have been included in the EMPr (Annexure F).

6.2 Bats

Bat impact assessments, which in South Africa are required to gain input from 12 months of pre-construction bat monitoring, are a key specialist component of the EIA process for a wind farm. The completion of this monitoring period is a condition of the EIR phase for wind farms by DFFE. This study was conducted during 2015 and 2016, by Animalia Consultants (Animalia Consultants, 2017(a)). Stephanie Dippenaar Consulting was subsequently appointed by Business Venture Investments No. 2105 (Pty) Ltd to undertake a bat monitoring study to assess the impacts of the revised proposed Kokerboom 3 Wind Farm and Animalia Consultants contributed to the final assessment appended to this Draft EIR (Refer Annexure D). The winter season was omitted as a substantial section of the site was already investigated and the previous monitoring study found bat activity to be very low during the winter months. Bat monitoring commenced on 16 August 2019, when static recorders were installed, and monitoring was completed on 5 June 2020.

The meteorological masts (commonly referred to as met masts), are provided by the developer and provide climatic data used for wind modelling required for the technical feasibility of the project. They are tall and allow the recording devices to reach up to 80m high with a second device fitted at 10m. The short masts were erected by the bat specialists and monitored bat movement at a height of 10m. More detail on the methodology undertaken for the study can also be found in the specialist report in Annexure D.

6.2.1 Description of the environment

The site is located within an arid region that experiences a winter rainfall regime. The land is currently chiefly used for extensive grazing for mainly sheep livestock. It is a dry, open landscape of large livestock farms located within the Nama-Karoo biome and occupies the Bushmanland Basin Shrubland and Bushmanland Vloere vegetation units. A few roosting resources are available for bats on site; however, they are in relatively low abundance. The vegetation across the majority of the site hosts foraging and commuting activities of bats. High bat activity is anticipated within and around the pans on site once they receive precipitation.

The presence of bats in an environment are largely connected to areas providing roosting and foraging habitats. Vegetation types and the presence of houses and buildings are therefore suitable indicators for potential roosting sites. The presence of watercourses and certain vegetation types providing insect habitat would be indicators of potential foraging sites. The bat specialists suggest that the vegetation type has a low to moderate rating for roosting and foraging potential. The plateau areas and shrubland may support bat activity, but it is not expected to harbour large roosts. It is however likely that bat activity would increase after rainfall when insect populations are prevalent. Furthermore, there are very limited buildings located on the affected farm portions.

The Scoping Report for Kokerboom 3 identified that four bat species were likely to be present on site, namely: *Miniopterus natalensis* (Natal long-fingered bat), *Neoromicia capensis* (Cape serotine), *Tadarida aegyptiaca* (Egyptian free-tailed bat), and *Eptesicus hottentotus* (Long-tailed serotine).

Tadarida aegyptiaca, *Neoromicia capensis*, and *Miniopterus natalensis* (Figure 6-6) were most commonly detected across the study area. The first two abundant species are of high value to the local ecosystems as they provide a greater contribution to certain ecological services (such as insect control) than the rarer species due to their high numbers. *Eptesicus hottentotus* was detected on site in very low abundances and at sporadic intervals.

Figure 6-6 | The three most common bats found on site: A) *Tadarida aeyptiaca*, B) *Neoromicia capensis*, and C) *Miniopterus natalensis*

Minopterus natalensis is a migratory species and was detected by all monitoring systems apart from Short Mast 1. The relative abundance of this species was highest, however there was no detection of a migratory event by any one of the monitoring systems which suggests that the site does not fall within a migratory route of this species. The bat specialist assessment identified a small peak in activity of *M. natalensis* on and near the site over the months of October – December and recommended that the design of the operational monitoring programme consider the possibility of a migratory event as a precautionary approach.

Although the bat activity was different for each species and at the different masts and monitoring locations, the general trend suggested that bats were active throughout the night in the warmer summer and spring months but were restricted to the earlier hours of the evening during the colder winter and autumn months. Bat activity is also related to wind speed, with reduced activity found during windy conditions. This is partly because of the difficulty of flight during high winds, and partly because of the reduced source of insects to feed on. The quantitative information provided for this analysis is included in the bat assessment report (Annexure D).

During the Scoping Phase, a sensitivity map was created providing no-go areas for turbines (not for roads and other infrastructure). The proposed final turbine layout considered this sensitivity map and avoided the buffered areas.

6.2.2 Impact assessment with mitigation measures

Although most bats are highly capable of advanced navigation using echolocation and excellent sight, they are still at risk of physical impact caused by the WEF development. The highest impact is likely to be caused during the operational phase through either direct collision with the turbine blades, or through barotrauma[10]. Bats will however also be impacted upon through the destruction of their habitats which will mostly occur during the construction phase. The following potential impacts are assessed in the tables below.

- Roost disturbance (-);
- Roost destruction (-);
- Loss of foraging habitat (-);
- Creating bat conducive habitat on the development terrain (-);
- Bat mortalities due to direct blade impact or barotrauma during foraging and commuting activities;
- Bat mortalities due to direct blade impact or barotrauma during migration; and
- Artificial lighting

Table 6-6 | Roost disturbance

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Bat roosts will be impacted upon by construction activities of roads, buildings, substation(s), and installation of turbines. No confirmed roosts have been found on site			

[10] Barrotrauma occurs where low air pressure is found around the moving blades of wind turbines, causing the lungs of a bat to collapse which results in internal haemorrhaging which is fatal.

	but there are potential roosts areas that bats may be using such as trees, rocky crevices, and derelict buildings	
	Pre-Mitigation	**Post-Mitigation**
Nature	Negative	Negative
Extent	Local	Site Specific
Intensity	Low	Low
Duration	Short term	
Significance	**Moderate (-)/Medium**	**Minor (-)/Low**
Probability	Probable	Unlikely
Confidence	Unsure	Sure
Reversibility	Unknown	Reversible
Mitigation measures		
• 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. • 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.		

Table 6-7 | Roost destruction

Phase	Pre-Construction	**Construction**	Operational	**Decommissioning**
Impact description	WEFs have the potential to impact bats directly through the physical destruction of roosts during construction. No confirmed roosts have been found on site but there are potential roosts that bats may be using such as trees, rocky crevices, and buildings.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Site Specific	
Intensity	High		Medium	
Duration	Short Term		Short Term	
Significance	**Moderate (-)/Medium**		**Minor (-) Low**	
Probability	Probable		Unlikely	
Confidence	Unsure		Sure	
Reversibility	Irreversible		Reversible	
Mitigation measures				
• 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 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.				

Table 6-8 | Loss of foraging habitat

Phase	Pre-Construction	**Construction**	Operational	Decommissioning

Impact description	Loss of foraging habitat within the site boundaries.	
	Pre-Mitigation	**Post-Mitigation**
Nature	Negative	Negative
Extent	Site Specific	Site Specific
Intensity	Low	Very Low
Duration	Long Term	Long Term
Significance	**Minor (-)/Low**	**Negligible (-) Very Low**
Probability	Definite	Probable
Confidence	Sure	Certain
Reversibility	Irreversible	Reversible
Mitigation measures		
• 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. • This impact must be reduced by limiting the removal of vegetation, particularly trees, as far as possible. • 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.		

Table 6-9 | Creating bat conducive habitat on the development terrain

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	Bats roosting or visiting the development site need to be protected but attracting bats from the adjacent environment should be avoided.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Site Specific	
Intensity	Medium		None	
Duration	Long Term		None	
Significance	**Minor (-)/Low**		**Negligible (-) Very Low**	
Probability	Probable		Unlikely	
Confidence	Unsure		Sure	
Reversibility	Reversible		Reversible	
Mitigation measures				
• 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 Neoromicia capensis, could enter at a hole the size of a finger. Sealing of roofs should be maintained throughout the lifespan of the wind farm. • 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.				

Table 6-10 | Bat mortalities due to direct blade impact or barotrauma during foraging and commuting activities

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	Impact on bat population numbers. Bats may be killed by direct collision with the blades, or barotrauma, during foraging activities. If the number of bat mortalities is significant, local bat populations may not recover.			

	Pre-Mitigation	Post-Mitigation
Nature	Negative	Negative
Extent	Local	Local
Intensity	High	Medium
Duration	Long Term	Long Term
Significance	**Major (-)/ High**	**Moderate (-)/Medium**
Probability	Probable	Probable
Confidence	Sure	Sure
Reversibility	Irreversible	Reversible
Mitigation measures		
• 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. • The height of the lower blade swept area must be maximised as far as reasonable feasible. • 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. • Apply additional curtailment, as recommended by a bat specialist, if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan *et al*. 2018)		

Table 6-11 | Bat mortalities due to direct blade impact or barotrauma during migration

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Impact on bat population numbers. Bats may be killed by direct collision with the blades, or barotrauma, during migration. If the number of bat mortalities is significant, local bat populations may not recover.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	High		Medium	
Duration	Long Term		Long Term	
Significance	**Major (-)/ High**		**Minor (-)/Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	Irreversible		Reversible	
Mitigation measures				
• 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. • The height of the lower blade swept area must be maximised, as far as reasonably feasible. • 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.				

- Apply additional curtailment, as recommended by a bat specialist, if mortality occurs beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018)

Table 6-12 | Artificial lighting

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	Impact on bat populations and diversity.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Site specific		Site specific	
Intensity	Medium		Low	
Duration	Long Term		Long Term	
Significance	**Moderate (-)/ Medium**		**Minor (-)/Low**	
Probability	Probable		Unlikely	
Confidence	Sure		Sure	
Reversibility	Reversible		Reversible	
Mitigation measures				

- This impact can be mitigated by using as little lighting as possible, and only where essential for operation of the facility.
- 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.
- 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.
- 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.

6.2.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the bats are concerned. Overall, the very low human population in the study area is advantageous to bats. The no-go option would therefore be advantageous for the ecological integrity of the study area as far as bats are concerned.

6.2.4 Bat impact statement

Overall, the proposed wind farm development and turbine layout is deemed acceptable from a bat sensitivity perspective and the development can proceed, subject to the strict implementation of the above outlined mitigation measures.

The impacts on bats will be monitored during the operational phase monitoring, and the recommended mitigation measures will be adjusted according to the results of the operational monitoring. This is an adaptive management approach, and it is crucial that any changes, suggested by the appointed bat specialist, to the initial proposed mitigation schedule be implemented within maximum two weeks from the date of the

recommendation, unless the recommendation refers to a time period later in the future (e.g. the following similar season/climatic condition).

Furthermore, the South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities, or any applicable guideline that supersedes this, will be considered in determining fatality thresholds during the operational phase of the project. Applicable thresholds for the site will be determined during the design of the operational monitoring programme. Note that the most recent guideline applicable at the time that the operational monitoring programme is designed, will be consulted.

The proposed layout for Kokerboom 3 is illustrated in Figure 6-7 superimposed over the areas of bat sensitivity as identified by the specialist.

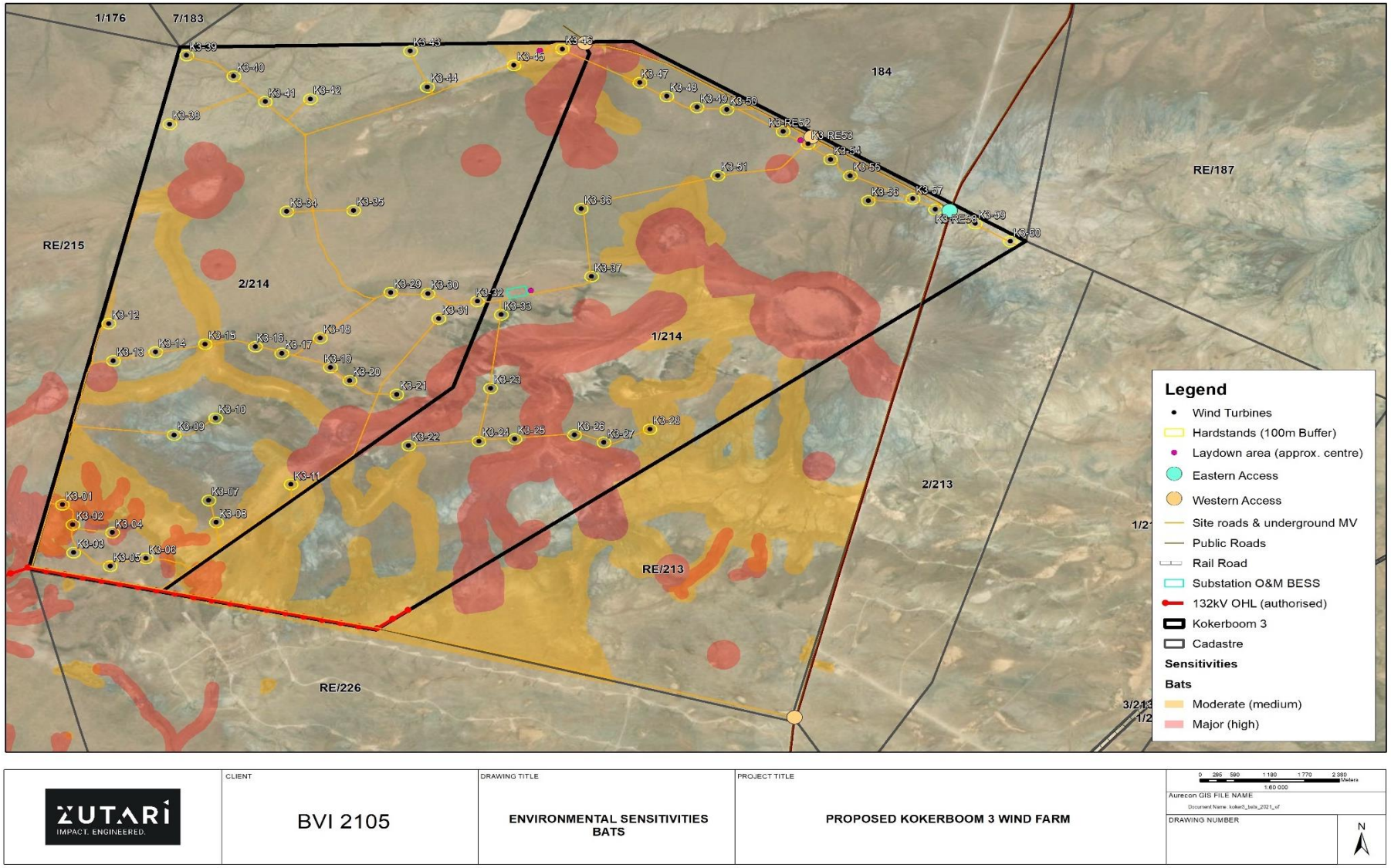


Figure 6-7 | Bat sensitivity map for the Kokerboom 3 Wind Farm

6.3 Avifauna (birds)

The proposed Kokerboom 3 Wind Farm study area comprises habitat which may sustain several bird species which may be impacted by the proposed facility. The pre-construction monitoring protocol was designed in accordance with the *"Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa"* (Jenkins *et al.* 2011) which was published by the Endangered Wildlife Trust (EWT) and BirdLife South Africa (BLSA) in March 2011, and subsequently revised in 2011, 2012 and 2015. In accordance with these guidelines monitoring was implemented during 2-8 July 2019 (Winter), 11-14 November 2019 (Spring), 4-10 January 2020 (Summer) and 15-22 March 2020 (Autumn). The monitoring period consisted of four site visits, roughly every three months, to represent the four seasons. The objective of pre-construction monitoring is to obtain baseline data on the abundance and diversity of birds at the site with a suitable control site to measure the potential displacement effect of the WEF. Furthermore, it is to also identify the flight patterns of priority species at the site to measure the potential collision risk with the turbines. The final layout was subjected to a detailed survey (walkdown) carried out in June 2021

The full avifaunal impact assessment is included in Annexure D.

6.3.1 Description of the environment

The proposed WEF and control area are located on a vast flat plain with a mixture of gravel and sandy areas. The control area is located between 3 and 10km north of the application site. The vegetation consists of Bushmanland Basin Shrubland. Bushmanland Basin Shrubland consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum, Salsola, Pentzia, Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* and *Leysera* . A number of ephemeral drainage lines flow though the study area, but they only hold water for brief periods after exceptional rainfall events, which are rare events.

The proposed wind farm site and control area are situated in an ecological transitional zone between the Nama Karoo and Succulent Karoo biomes (Harrison *et al.* 1997). In comparison with Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover. The ecotonal nature of the study area is apparent from the presence of typical avifauna of both Succulent and Nama Karoo at the wind farm site and control area e.g. Karoo Eremomela *Eremomela gregalis* (Succulent Karoo) and Red Lark (Nama Karoo).

A feature of the arid landscape where the proposed site and control area are located is the presence of pans. Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are typical of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m) and flooding characteristically ephemeral (Harrison *et al.* 1997).

The application site contains several small to medium-sized pans, and there are several larger pans situated north and east of the proposed WEFs (e.g. Kareedoringpan, Boegoefonteinpan, Bitterputspan, Brakpan and several smaller unnamed ones). When these pans hold water (which is only likely after exceptional rainfall events), waterbird movement to and from these pans is possible, including Greater Flamingo and Lesser Flamingo. It is possible that nocturnal flamingo movement might take place over the proposed wind farm site between coast and the abovementioned pans, although this should be sporadic rather than regularly. It is estimated that a total of 225 bird species could potentially occur in the broader area.

Between July 2019 and March 2020, four site visits were undertaken by the avifaunal specialist. It is estimated that a total of 225 bird species could potentially occur in the broader area and of these, 32 species are classified as priority species. During the monitoring periods 48 bird species were recorded, of which 7 are considered priority species. These Red List species are listed below in Table 6-13. The list of species identified to date have been

included in Annexure D as part of the Avifaunal specialist Assessment Report and has been updated during the EIA Phase.

Table 6-13: Priority species identified on site and listed as Threatened on the IUCN Red

Scientific name	Common name	Conservation status[11]
Falco rupicoloides	Greater Kestrel	LC - Least concern
Eupodotis vigorsii	Karoo Korhaan	LC - Least concern
Neotis ludwigii	Ludwig's Bustard	EN - Endangered
Afrotis afraoides	Northern Black Korhaan	LC - Least concern
Melierax canorus	Pale Chanting Goshawk	LC - Least concern
Calendulauda burra	Red Lark	VU - Vulnerable
Bubo africanus	Spotted Eagle-Owl	LC - Least concern

Priority species that may appear on a regular basis at the proposed Kokerboom 3 WEF can be classed as terrestrial species, soaring species, or occasional long-distance fliers. Terrestrial animals spend the majority of their time foraging on the ground. They don't fly very often, and when they do, it's usually for short distances at a low to medium height. At the application site, Northern Black Korhaan, Ludwig Bustard, and Karoo Korhaan and Kori Bustard are included in this category. Occasional long-distance fliers generally behave as terrestrial species but can and do undertake long distance flights on occasion. Species in this category are Ludwig's Bustard, Greater Flamingo and Lesser Flamingo, although the latter two species are not expected to occur regularly. Soaring species spend a significant time on the wing in a variety of flight modes including soaring, kiting, hovering and gliding at medium to high altitudes. At the application site, these include all the raptors which could regularly occur i.e. Black-shouldered Kite, Lanner Falcon, Booted Eagle, Martial Eagle, Greater Kestrel and Pale Chanting Goshawk. Based on the time spent potentially flying at rotor height, soaring species are likely to be at greater risk of collision.

Specific behaviour of some species might put them at risk of collision, e.g. display flights of Northern Black Korhaan and Red Lark may place them within the rotor swept zone, potentially resulting in mortalities (Ralston-Paton & Camagu 2019). However, both the number and altitude of display flights of Red Larks decrease significantly at wind speeds of above 2.5m/second (R. Colyn pers. comm). The typical cut-in speed for the turbines at the WEF will be 3m/second, which significantly decreases the risk of collisions. It is notable that there are no published records of Red Lark fatalities thus far at operational wind farms in South Africa (Ralston-Paton & Camagu 2019). The collision risk for Red Larks is limited to periods of active display flights at the onset of and during breeding events. Active display flights, and therefore breeding events, are triggered by rainfall events which takes place in an unpredictable manner on a temporal and spatial scale. The display activity gets triggered by rainfall events of 15mm or higher, and the activity lasts up to four weeks after the event (R. Colyn pers. comm). The rainfall events can be either single large or multiple smaller events over a week which would be a potential trigger for breeding events. The level of display flight activity and altitude is largely governed by the wind strength. All flight activity and altitude are significantly reduced at wind speeds above 2.5m/s (measured at ground level).

[11] IUCN. 2016. The IUCN Red List of Threatened Species. Version 2016-1. Online. www.iucnredlist.org [Accessed on 20 November 2020].

Figure 6-8: Red Lark, *Calendulauda burra*. (Source: www.avianleisure.com**)**

The proposed Kokerboom 3 WEF will also pose a collision risk to several priority species which could occur regularly at the site. Species exposed to this risk are large terrestrial species i.e. mostly bustards such as Karoo Korhaan, Ludwig's Bustard, Kori Bustard and Northern Black Korhaan, although bustards generally seem to be not as vulnerable to turbine collisions as was originally anticipated (Ralston-Paton & Camagu 2019). Also at risk, but less so due to irregular occurrence, are Greater and Lesser Flamingo if and when the pans fill up after good rainfall. Passerines which could be at risk are Red Lark during display flights, and Sclater's Lark, when commuting between breeding areas and surface water, although the reduction in display flight activity at wind speeds of higher than 2.5m/s greatly reduces this risk for Red Larks. Lastly, soaring species, i.e. raptors such as Martial Eagle, Pale Chanting Goshawk, Lanner Falcon, Booted Eagle, Black-shouldered Kite and Greater Kestrel are probably most at risk of all the priority species regularly occurring at the application site.

6.3.2 Impact assessment with mitigation measures

The proposed Kokerboom 3 WEF is likely to have a range of direct and indirect negative impacts on avifauna. These are likely to include:

- Displacement due to disturbance (-)
- Displacement due to habitat transformation (-)
- Collision mortality on the wind turbines (-)

These impacts are summarised below and assessed for the proposed Kokerboom 3 Wind Farm.

Table 6-14 | Displacement of priority species due to disturbance

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	During the construction and decommissioning phases of the project, there will be an increase of vehicle and personnel movement which may disturb the resident avifauna. It is also possible that disturbance may be caused on birds altering their migration flyways or local flight paths to avoid a wind farm, which could result in increased energy expenditure if they need to fly further. It may also result in the disruption of linkages between distant feeding, roosting, moulting and breeding areas otherwise unaffected by the wind farm. Specifically, for the proposed Kokerboom 3 Wind Farm, it is unlikely that any of the priority species would be displaced permanently, although it is very likely that they will be displaced for the construction and decommissioning phases. If the wind farm follows the modern trend of fewer, larger turbines (which seems to be the case), the risk of displacement due to disturbance is also lower. However, this will only be conclusively established through a post-construction monitoring programme.			

	Comment from the Avifaunal specialist on the final significance: *It is inevitable that a measure of displacement will take place for all priority species during the construction phase, due to the disturbance factor associated with the construction activities. This is likely to affect ground nesting species the most, as this could temporarily disrupt their reproductive cycle. Regularly occurring species which fall in this category are Red Lark, Ludwig's Bustard, Northern Black Korhaan, Karoo Korhaan and Spotted Eagle-Owl and some which may occur but less regularly such as Sclater's Lark and Kori Bustard. Some species might be able to recolonise the area after the completion of the construction phase, but for some species this might only be partially the case, resulting in lower densities than before once the WEF is operational, due to the disturbance factor of the operational turbines*.

	Pre-Mitigation	**Post-Mitigation**
Nature	Negative	Negative
Extent	Limited/Site specific	Limited/Site specific
Intensity	High	Medium
Duration	Short Term	Short Term
Significance	**Minor (-)/Low**	**Minor (-)/Low**
Probability	Highly Probable	Highly Probable
Confidence	High	Medium
Reversibility	Medium	Medium

Mitigation measures

- Restrict the construction activities to the construction and decommissioning footprint area.
- Do not allow any access to the remainder of the property during the construction period.
- 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 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

Table 6-15 | Displacement of priority species due to habitat transformation

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	The scale of permanent habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project which for the case of the proposed Kokerboom 3 Wind Farm would amount to approximately 80ha. The impact of habitat loss/ transformation is less for the turbines (due to their isolated footprints) than the associated roads and transmission lines which may cause fragmentation in the habitat. **Comment from the Avifaunal specialist on the final significance**: *The network of roads is likely to result in significant habitat fragmentation, and it will most likely have an effect on the density of several species, particularly larger terrestrial species such as Ludwig's Bustard, Kori Bustard and Northern Black Korhaan, and possibly also on smaller passerines such as the Red Listed Sclater's Lark or Red Lark. Given the current proposed density of the proposed turbine lay-out and associated road infra-structure, it is not expected that any priority species will be permanently displaced from the development area. It should be noted that the overall abundance of birds at the adjacent Loeriesfontein 2 and Khobab wind farms have decreased significantly, compared to pre-construction levels. While this can be partially explained by the drought conditions which were prevalent*			

	during the operational monitoring, the same levels of decrease have not been observed at the control site.

	Pre-Mitigation	Post-Mitigation
Nature	Negative	Negative
Extent	Local	Local
Intensity	Medium	Medium
Duration	Permanent	On-going
Significance	**Minor (-)/Low**	**Minor (-)/Low**
Probability	Probable	Probable
Confidence	Sure	Sure
Reversibility	Medium	Medium

Mitigation measures

- Little mitigation is possible to prevent the permanent habitat transformation caused by the construction of the wind farm.
- 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.

Table 6-16 | Mortality of priority avifauna due to turbine collisions

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Bird fatalities due to collisions with wind turbines have consistently been identified as the main ecological drawback of wind farms, although these collisions appear to kill fewer birds than other man-made infrastructure such as power lines, buildings or even traffic. However, even with the low fatality rates, these mortalities may have significant impacts on population levels for some species. The most effective mitigation measure to prevent collision mortality is the avoidance of sensitive areas, points or flight paths. Mitigation measures cannot be applied to all sites, and depends on the characteristics of the site, as well as the diversity of species. Importantly, there is some indication that flight activity for all priority species (both soaring and terrestrial) is most prevalent during light to gentle breezes, and less so during moderate to high winds when the wind turbine activity increases. **Comment from the Avifaunal specialist on the final significance**: *The proposed Kokerboom 3WEF will pose collision risk to several priority species which could occur regularly at the site. Species exposed to this are large terrestrial species i.e. mostly bustards such as Karoo Korhaan, Ludwig's Bustard, Kori Bustard and Northern Black Korhaan, although bustards generally seem to be not as vulnerable to turbine collisions as was originally anticipated (Ralston-Paton & Camagu 2019). Also at risk, but less so due to irregular occurrence, are Greater and Lesser Flamingo if and when the pans fill up after good rainfall. Passerines which could be at risk are Red Lark during display flights, and Sclater's Lark, when commuting between breeding areas and surface water, although the reduction in display flight activity at wind speeds of higher than 2.5m/s greatly reduces this risk for Red Larks. Lastly, soaring species, i.e. raptors such as Martial Eagle, Pale Chanting Goshawk, Lanner Falcon, Booted Eagle, Black-shouldered Kite and Greater Kestrel are probably most at risk of all the priority species regularly occurring at the application site.*			

	Pre-Mitigation	Post-Mitigation
Nature	Negative	Negative

Extent	Limited/Site specific	Limited/Site specific
Intensity	High	High
Duration	Permanent	Permanent
Significance	**Moderate (-)/Medium**	**Minor (-)/Low**
Probability	Highly Probable	Probable
Confidence	High	High
Reversibility	Medium	Medium
Mitigation measures		

- 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 parallel to the public road on the other side of the road from the water point, on Portion 1 of Farm 214.
- 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.
  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)
- 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.
- Placement of turbines in highly suitable Red Lark habitat to be avoided where possible. If avoidance is not possible, 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, for turbines located in areas of highly suitable Red Lark habitat, as determined by the avifaunal specialist. The increased cut-in speeds to be maintained for a period of six weeks after the rainfall event.
- 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 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).
- 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).

Table 6-17 | Displacement of priority species

Phase	Pre-Construction	Construction	Operational	**Decommissioning**
Impact description	Displacement of priority species due to dismantling activities			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited/Site specific		Limited/Site specific	
Intensity	Moderate		Moderate	
Duration	Short Term		Short Term	
Significance	**Minor (-)/Low**		**Minor (-)/Low**	
Probability	Likely		Likely	
Confidence	Medium		Medium	

Reversibility	Low	Low
Mitigation measures		
• Restrict the construction activities to the decommissioning footprint area • Do not allow any access to the remainder of the property during the decommissioning period.		

6.3.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the avifauna is concerned. Overall, the very low human population in the study area is advantageous to avifauna. The no-go option would be advantageous for the ecological integrity of the study area as far as avifauna is concerned.

6.3.4 Avifaunal impact statement

The proposed Kokerboom 3 WEF will have a low to moderate impact on avifauna which, in all instances, could be reduced to a low impact through appropriate mitigation. The final layout was subjected to a detailed survey (walkdown) carried out in June 2021. Provided the recommended mitigation measures are strictly applied, the lay-out of the Kokerboom 3 Wind Farm site is acceptable from an avifaunal impact perspective and the project could proceed.

The proposed layout for Kokerboom 3 is illustrated in Figure 6-9 superimposed over the areas of avifaunal sensitivity as identified by the specialist.

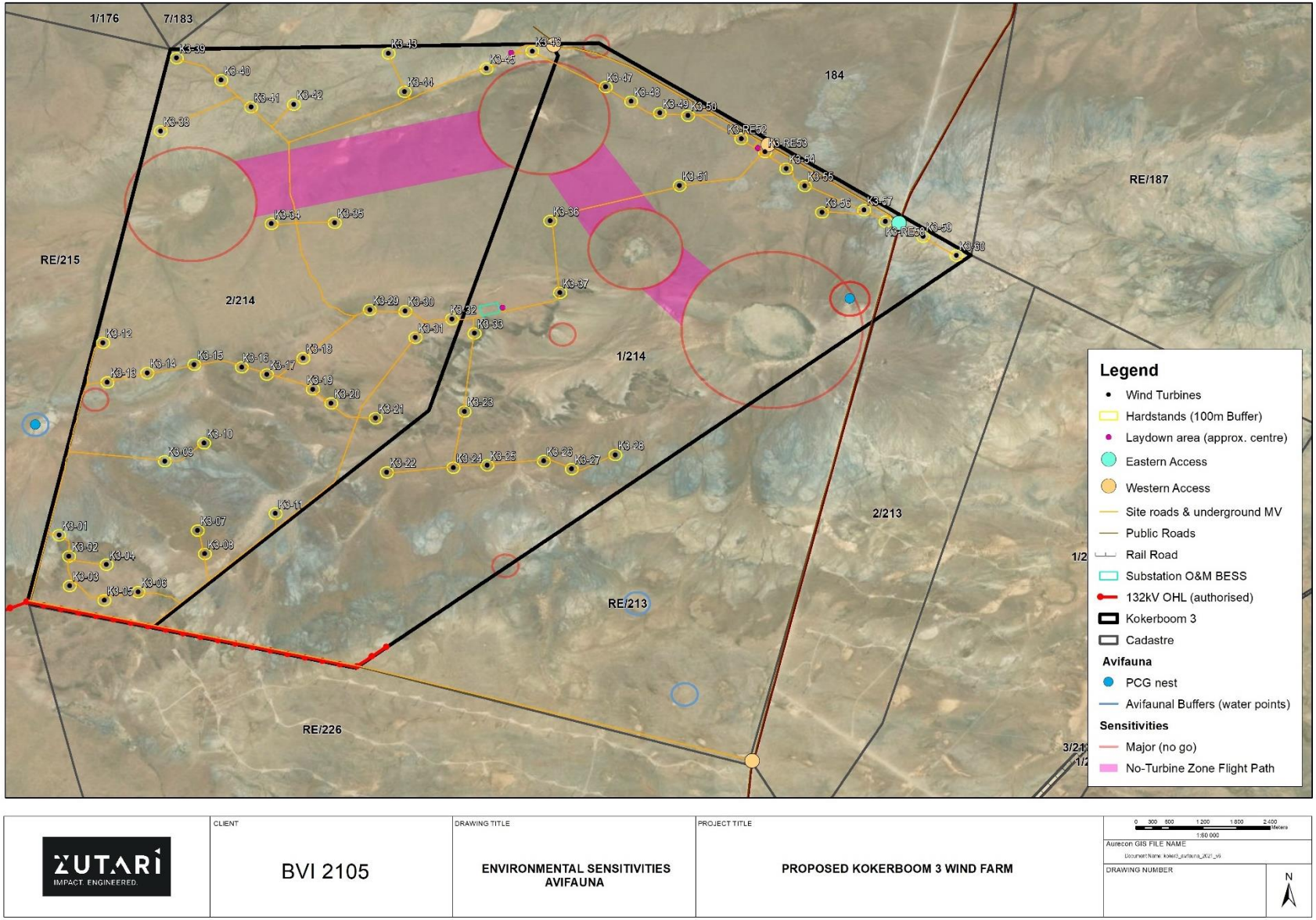


Figure 6-9 | Avifaunal sensitivity map for the Kokerboom 3 Wind Farm

6.4 Aquatic Ecology

The site for the proposed Kokerboom 3 WEF is located within the low rainfall region of South Africa, with a Mean Annual Precipitation (MAP) of between 100 - 200 per annum usually in the summer months. However, in the three of the 4 occasions the author has visited the region since 2014, significant rainfalls had occurred in winter. Annual average temperatures range between -2 and 39 o C (Mucina & Rutherford, 2007).

It is predicted in the Climate Change Model Projects for Northern Cape Province[12], that by 2050 there will changes in the following areas: average temperatures, very hot days, heat wave days, high fire danger days, average rainfall, extreme rainfall events and dry spell days. It is anticipated that the province will get hotter and drier, with more rain falling in extreme rainfall events which could lead to flooding events. These changes would impact the water availability of the area, as well as future drainage patterns.

Farms in the area have limited access to water and rely on groundwater abstracted through boreholes to feed to their livestock

Prior to this assessment phase, specialists were commissioned to assist with the design and placement of the turbines and internal roads, through the identification of sensitive features and constraints in a screening or constraints assessment. This provided input into the design process, allowing the Applicant to avoid and or minimise potential impacts by aligning the layout to avoid impacts prior to the commencement of the formal Environmental Impact Assessment process, i.e. prior to the Scoping and EIA phases.

During the screening assessment, a four-day site visit of the area was conducted in May 2020, in which the habitats / species listed above were considered, together with a description of the general environment and species assemblages found present. This spatial data was then supplied to the Applicant to develop the layout outside of these areas (inclusive of suitable buffers) as a mechanism of impact avoidance using fine scale mapping data. The study area had received some much needed winter rainfall, which aided in critically assessing the ecological character of the site, with particular reference to any linkages between the aquatic and terrestrial environment as indicated in the Screening Tool Results (ESA & NFEPA). The information collected, was also compared to previous assessments within the region by members of EnviroSci, used in the assessment of the wind farms that have been completed. A second site visit was then conducted in June 2021 to assess the layout contained in this report, to ground truth the potential layout according to the sensitivity layers presented. More detail on the methodology undertaken for the study can be found in the specialist report in Annexure D.

6.4.1 Description of the environment

The study area is characterised by small / narrow perennial water courses and drainage lines. Although most of the D53F catchment systems are disconnected watercourses some of which flow into endorheic pans to the north and north east of the site. The D53F systems associated with the study area are thus not connected to any main stem rivers (e.g. Sak River, ca. 100km east of the site).

As detailed in the specialist report (Annexure D), the western and eastern edges of the proposed Kokerboom 3 Wind Farm property boundary are located within NFEPA areas, which are due to contain potential habitat that may act as refugia and/or support an important aquatic ecosystem downstream. However, the specialist did not observe any direct aquatic species during the site visit and therefore it is assumed that these areas must be related to lower portions of the catchment.

The study area is dominated by four main aquatic features associated with catchments and watercourses and associated vegetation types as described in this report and are as follows:

[12] EnviroTech Solutions. 2016. Climate Change Model Projections for the Northern Cape Province. Report prepared for the Department of Environment and Nature Conservation for presentation to the DEA and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

- Riverine Alluvial watercourses, with no distinct riparian zone
- Riverine Minor drainage lines
- Pan (wetland) Endorheic Pan/Depressions
- Artificial Dams and reservoirs

Notably most of the aquatic features within the broader study area are located within the riverine valleys and alluvial floodplains, with no direct linkage to any mainstem rivers associated with the D35F quaternary catchment, all within the Nama Karoo Ecoregion located in the Lower Orange Water Management Area (DWS Upington Office). Furthermore, the study area is not located within any Strategic Water Resource areas or wetland clusters.

6.4.2 Impact assessment with mitigation measures

The placement of turbines and associated infrastructure may have impacts on the surface water which are likely to include:

- Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies (-)
- Potential impact on localised surface water quality (-)
- Loss of riparian systems and disturbance to alluvial watercourses (-)
- Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion (-).

Table 6-18 | Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies in the construction phase

Phase	Pre-Construction	**Construction**	Operational	**Decommissioning**
Impact description	Damage or loss of riverine systems, wetlands and water courses through the placement of new crossings or infrastructure. Construction could result in the loss of riverine and wetland systems that are still functional and provide an ecosystem services within the site especially where new access roads are required Loss can also include a functional loss, through change in vegetation type via alien encroachment for example. However aquatic systems rated with a High sensitivity can easily be avoided. Attention must be paid to the internal road between Turbines 11, 21 & 32, as this road crosses significant portions of an alluvial watercourse that could be avoided. Similarly, the access road at the southern entrance should be sited in such a manner to avoid the observed depressions.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very limited	
Intensity	Moderate		Very low	
Duration	Medium-term		Short-term	
Significance	**Minor (-) Low**		**Negligible (-)/Very Low**	
Probability	Probable		Unlikely	
Confidence	High		High	
Reversibility	High		High	
Mitigation measures				
• 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..				

- 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.
- Where roads and crossings are upgraded, the following applies:
    - 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).

Table 6-19 | Potential impact on localised surface water quality (construction materials and fuel storage facilities) during the construction and decommissioning phases

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Potential impacts on localised water quality, although unlikely due to the ephemeral nature of the systems but would occur during when rainfall does occur. During construction earthworks will expose and mobilise earth materials, and a number of materials as well as chemicals will be imported and used on site and may end up in the surface water, including soaps, oils, grease and fuels, human wastes, cementitious wastes, paints and solvents, etc. Any spills during transport or while works are conducted in proximity to a watercourse has the potential to affect the surrounding biota. Leaks or spills from storage facilities also pose a risk and due consideration to the safe design and management of the fuel storage facility must be given. Although unlikely, consideration must also be provided for the proposed Battery Energy Storage System (BESS), with regard safe handling during the construction phase. This to avoid any spills or leaks from this system			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Limited		Very limited	
Intensity	High		Very low	
Duration	Medium-term		Brief	
Significance	**Minor (-) Low**		**Negligible (-)/Very Low**	
Probability	Likely		Probable	
Confidence	High		High	
Reversibility	Medium		High	
Mitigation measures				
• Any dust suppression must be kept to a minimum, to prevent the formation of pools, or runoff that may then contain pollutants. • 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.				

- 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).
- Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.
- 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.
- Littering and contamination associated with construction activity must be avoided through effective construction camp management.
- No stockpiling should take place within or near a water course
- All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.

Table 6-20 | Impact on alluvial riverine systems and wetland systems through the possible increase in surface water runoff on form and function during the operational phase

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Impact on aquatic systems through possible increase in surface water runoff within the wind farm site. Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the riverine / wetland systems, which are currently ephemeral, i.e. riverine systems become tree rather than shrub dominated, with a loss in instream plant biodiversity through shading, which then results in habitat changes / loss.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Limited	
Intensity	Moderate		Very low	
Duration	Long-term		Short-term	
Significance	**Minor (-)/Low**		**Negligible (-)/Very Low**	
Probability	Probable		Unlikely	
Confidence	High		High	
Reversibility	Medium		High	
Mitigation measures				
• 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. This stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses or similar) of exposed soil and the re-vegetation of any disturbed watercourses.				

6.4.3 No-go alternative

Should the project not proceed, then current status quo with regard the aquatic environment would remain unchanged. Overall, the site is in a largely natural state and would remain so for an indeterminate amount of time as the natural environment already limits the extent of increased agricultural production.

6.4.4 Aquatic ecology impact statement

The final layout was subjected to a detailed survey (walkdown) carried out in June 2021. According to the aquatic specialist, the final layout of the facility would have limited impact on the aquatic environment as the proposed structures, for the most part, have avoided the delineated watercourses. Based on the findings of the

specialist assessment, the specialist sees no cause to deny authorisation for any of the planned activities, if important mitigating measures are implemented.

This is based on the consideration that with the exception of several minor drainage line crossings, the remaining High & Moderate Sensitivity areas can be avoided, inclusive of any buffers provided in this report. The shared southern access road will need to traverse a small depression, which is considered to be acceptable as this particular depression has already been impact upon by previous roads thus is already disturbed. The road between Turbine 11, 21 and 32 was realigned to avoid spanning large sections of the alluvial watercourse observed, while the footprint of Turbine 35 will avoid the rocky outcrop as per the final micro-sited layout.

The proposed layout for Kokerboom 3 is illustrated in Figure 6-10 superimposed over the areas of aquatic sensitivity as identified by the specialist.

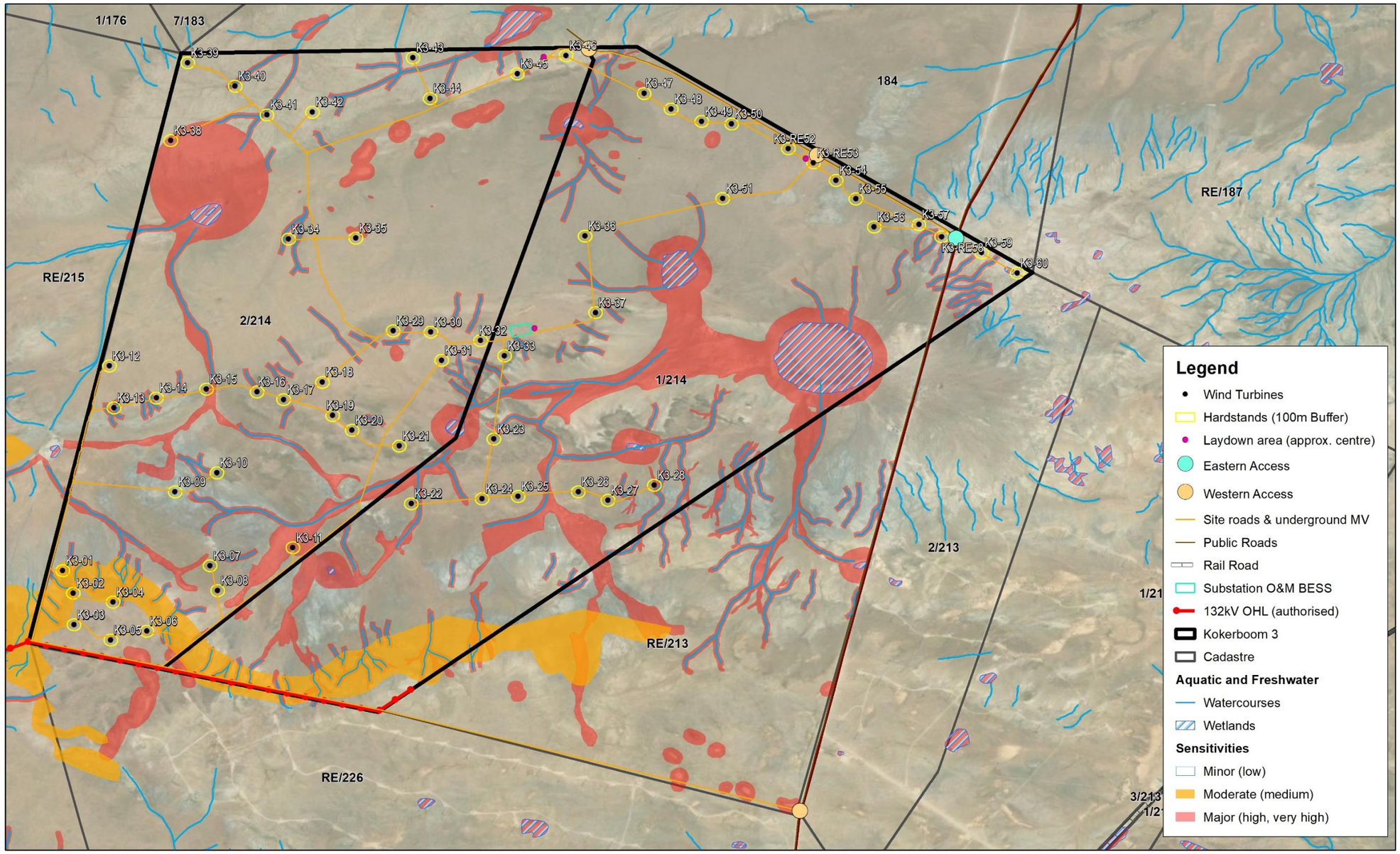


Figure 6-10 | Identification of sensitive aquatic no-go areas for Kokerboom 3 Wind Farm

6.5 Heritage (including Archaeology)

Heritage resources include archaeological material (e.g. rock paintings, stone tools), paleontological material (e.g. fossilised materials) and cultural heritage material (e.g. old graveyards, fences, ruins of buildings, or sense of place). A heritage impact assessment (HIA) for the proposed Kokerboom 3 Wind Farm (with associated infrastructure) is required as the WEF triggers Section 38 of the National Heritage Resources Act (Act 25 of 1999) (NHRA).

During the Pre-Application Phase of this EIA, an archaeologist and palaeontologist were commissioned to undertake the requisite investigations. Dr Jayson Orton of ASHA Consulting (Pty) Ltd was appointed to compile the HIA, inclusive of an archaeology assessment, and Dr John Almond of Natura Viva was appointed to undertake the paleontological investigation. During the Scoping Phase, the findings of these investigations were submitted to the two relevant Heritage Authorities, South African Heritage Resources Agency (SAHRA) and Ngwao Boswa Kapa Bokone (NBKB) for review.

During the Scoping Phase, it was identified that the potential of discovering palaeontological material on site was extremely low, and the potential impacts that the proposed Kokerboom 3 Wind Farm would have on these materials would be negligible. With the support of Dr Almond, the EAP indicated in the Scoping Report that this study should be scoped out (refer to Section 3.1.2) of the EIA process. A final comment from Dr Almond is appended to Annexure D in this regard. SAHRA provided an interim comment on 3 June 2021 (case number: 16417), that confirmed this approach by indicating no further palaeontology studies would be required. Proactive mitigation measures have however been included in Section 8.2 and the EMPr (Annexure F) in the case that any palaeontological finds are discovered during the construction phase. The rest of this section therefore refers only to the identified significant heritage environment, supported by the HIA included in Annexure D. It is informed by a combination of information identified through literature review, as well as three site investigations undertaken 20-21 February 2017, 24-28 February 2020 and 8,9 and 15 June 2021. The latter dates being a detailed walkthrough of the final layout.

6.5.1 Description of the environment

6.5.1.1 Cultural Heritage

The town of Loeriesfontein grew around a general store (Figure 6-11) that was established in 1894 by a travelling salesman. This store still exists as the Turner and Haupt SPAR under the ownership of the original salesman's grandson. The town is also home to the Windmill Museum which was established in the 1970s which gave Loeriesfontein the reputation of the windmill capital of South Africa. The original Loeriesfontein Hotel is still in operation which adds to the historical character of the town.

Figure 6-11 | The first building in Loeriesfontein, 1895 (source: Fred Turner Museum, Loeriesfontein)

The cultural significance of the rural area to the north of Loeriesfontein, in which the Kokerboom 3 Wind Farm is proposed, is largely characterised by the sense of place. The site has a very weakly developed cultural landscape since the majority of anthropogenic interventions relate to farm tracks and fences. The landscape is largely a natural one (although it does still have cultural significance for its aesthetic value), but has now been compromised by two neighbouring wind farm developments, the Helios Substation and associated power lines and the Sishen-Saldanha railway line which create a new 'cultural' layer on the landscape.

The farming practices (further described below in the socio-economic (Section 6.6) and visual (Section 6.8)) are low intensity, with moderate anthropogenic interventions mostly relating to farm tracks and fences. As such, there are limited structures and buildings within the footprint for the proposed Kokerboom 3 Wind Farm.

This landscape has influenced the movement of people and the use of the land. Very few farmsteads are located within the greater study area, with no houses identified within the Kokerboom 3 footprint. It therefore seems reasonable to assume that there is a low risk of finding grave sites within the area. Furthermore, due to the generally rocky substrate, the chance of impacting on graves is very limited.

6.5.1.2 Archaeology

The literature review conducted by the archaeologist (Annexure D) has found that "thousands of square kilometres of Bushmanland are covered by a low density lithic scatter."[13] The HIAs of the surrounding area have found this to be true, although it is found that the scatter tends to be more noticeable in the northern Bushmanland than in the south. The artefacts include material dating to the Early (ESA), Middle (MSA) and Later (LSA) Stone Ages.

Within the greater study area, there are reports of LSA or MSA artefacts located on the crests or at the foot of hills or in the margins of streams. Heritage resources were found to be fairly common in the study area but were mostly of very low cultural significance. A few archaeological sites of up to medium cultural significance were located. The farm complex in the north-western part of the study area contains heritage structures and ruins of up to medium significance. The landscape is also considered to be a heritage resource but its cultural component is very limited and a new layer of electrical infrastructure is starting to dominate the landscape around the site.

During the Scoping Phase, the following areas were considered more sensitive features and were avoided during the turbine layout namely archaeological site at waypoints 722, 1938 and 1939. The site at waypoint 091 was avoided by the final layout and site at waypoints 717 to 719 will be demarcated as no-go areas during construction and monitored by the ECO as per the EMPr.

6.5.1.3 Heritage resources

A light scattering of historical artefacts was noted along the northern margin of the large pan in the eastern part of the study area (Figure 6-12). They may well represent an area where camp was set up after heavy rains and before the first house was built on the farm. At the farm complex, which was built overlooking a pan, there is a ruined house built from sun-dried mudbricks on a stone plinth. A *muurkas* is evident and some windows and doors preserve wooden frames. While the roof beams were likely removed for reuse elsewhere, the presence of bamboo, much mud in the interior of the ruin and a flat-topped central wall suggest that the structure was very likely a brakdak. This complex was an ash and artefact dump located 60 m northwest of the ruined cottage. The artefacts include a wide variety of materials dating from the last decades of the 19th century as well as some 20th century materials. The former include transfer and hand-painted refined white earthenwares as well as glass from wine and possibly mineral water bottles and some iron fragments.

[13] Beaumont, P.B., Smith, A.B. and Vogel, C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) *Einiqualand: studies of the Orange River frontier*: 236-264. Cape Town: University of Cape Town Press.

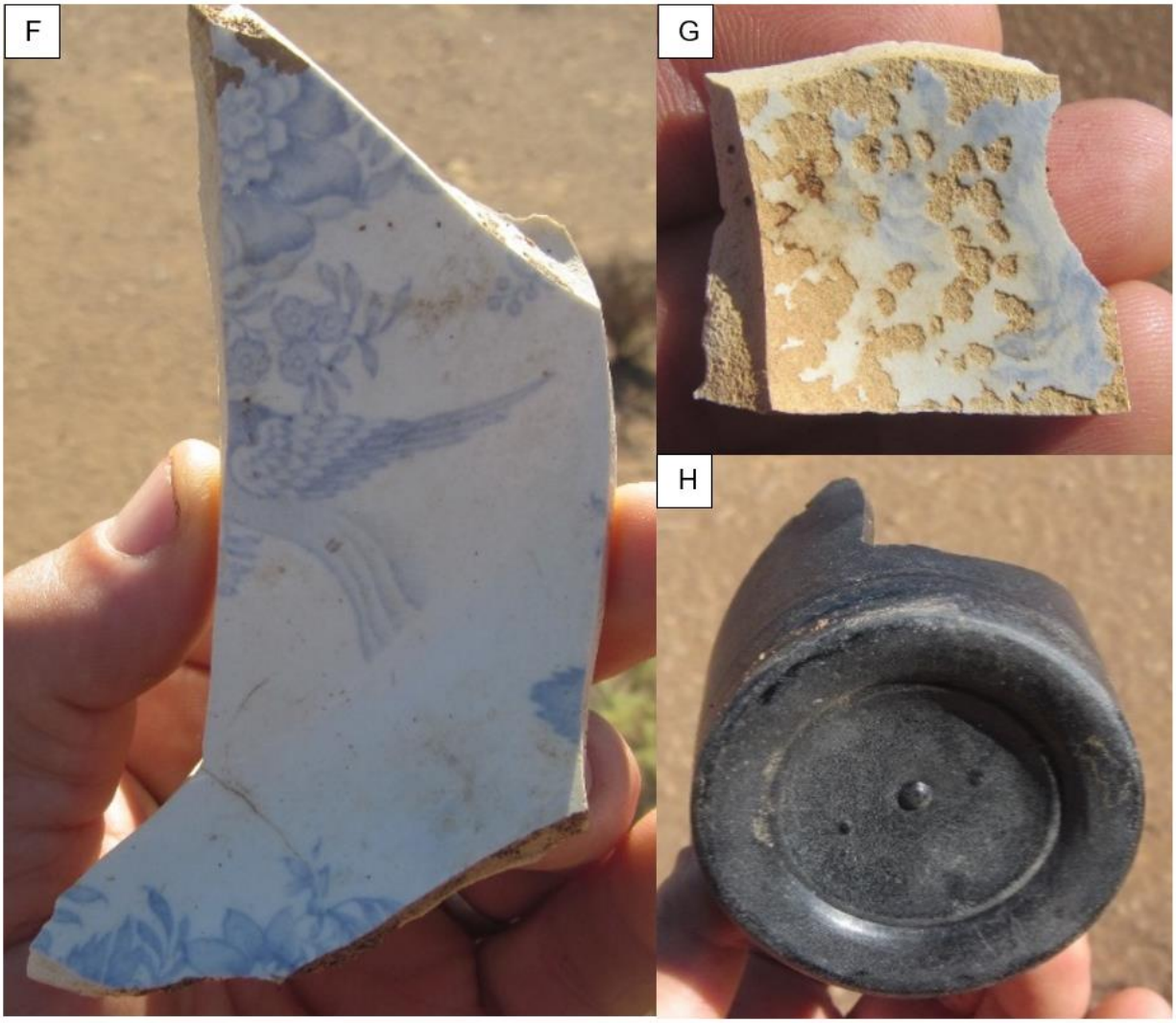
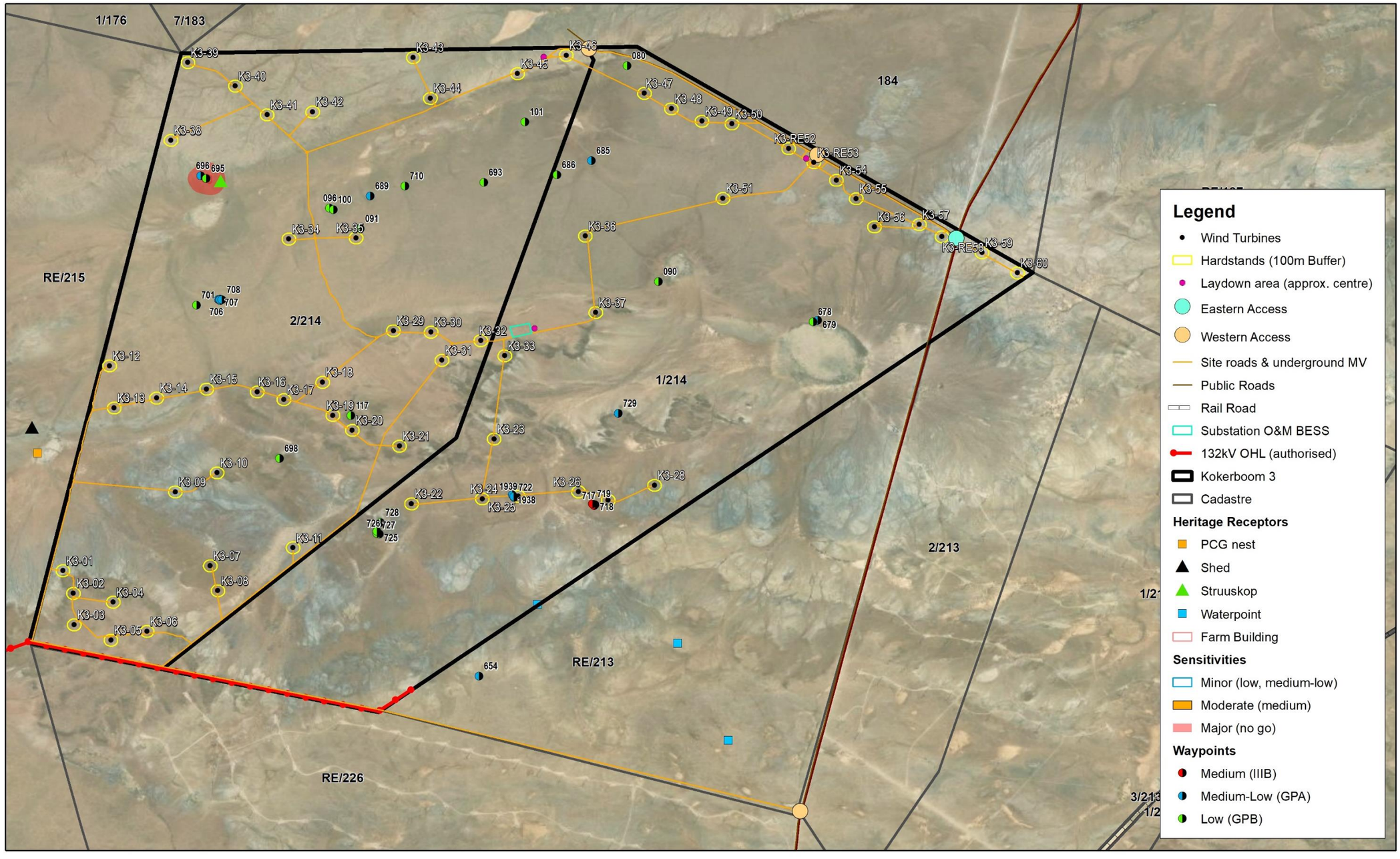


Figure 6-12:Historical artefacts from the northern margin of the large pan in the eastern part of the study area (near waypoint 679).F: They are transfer printed refined white earthenware; G: a coarse porcelain fragment with the glaze being sun-damaged; H: wine bottle base

The identified artefacts are illustrated and listed on the following page in Table 6-21 and Figure 6-13 below.



ZUTARI IMPACT. ENGINEERED.	CLIENT BVI 2105	DRAWING TITLE **ENVIRONMENTAL SENSITIVITIES HERITAGE**	PROJECT TITLE **PROPOSED KOKERBOOM 3 WIND FARM**	0 295 590 1 180 1 770 2 360 Meters 1:60 000 Aurecon GIS FILE NAME Document Name: koker3_heritage_2021_v9 DRAWING NUMBER N

Figure 6-13 |Heritage No-Go areas within the footprint of the proposed Kokerboom 3 Wind Farm inclusive of all "Waypoints/ Heritage resources" identified on site

Table 6-21 | List of heritage resources identified on site (source: J. Orton, 2021).

Waypoint		GPS	Description	Significance [mitigation]	Field rating
678		S30 21 30.9 E19 33 37.5	LSA stone artefact scatter on the northern edge of a pan. It has CCS artefacts and ostrich eggshell fragments.	Low	GPB
679		S30 21 30.0 E19 33 39.9	LSA stone artefact scatter on the northern edge of a pan. It has CCS artefacts and ostrich eggshell fragments. It was noted that there were many ostrich eggshell fragments and several historical glass and ceramic fragments along the edge of the pan in this area. These are not significant.	Low-medium	GPA
680		S30 19 38.6 E19 31 14.9	A dolerite outcrop with many ostrich eggshell fragments and occasional CCS artefacts.	Very Low	GPC
681		S30 19 38.7 E19 31 13.0	A dolerite outcrop with a cluster of ostrich eggshell in between boulders on the outcrop.	Very Low	GPC
682		S30 19 39.2 E19 31 13.3	A single small bedrock grinding patch (very shallow) on a dolerite outcrop.	Very Low	GPC
683		S30 19 42.1 E19 31 12.5	A dolerite outcrop with many ostrich eggshell fragments and one CCS artefact.	Very Low	GPC
684		S30 19 51.4 E19 31 32.5	A scatter of ostrich eggshell fragments, including one burnt piece, on a dune to the south of a pan.	Very Low	GPC
685		S30 20 03.2 E19 31 36.8	A scatter of CCS artefacts and ostrich eggshell fragments in an open area alongside a streambed and to the north of some dolerite outcrops. There is also one quartz artefact.	Low-medium	GPA
686		S30 20 11.0 E19 31 18.0	A scatter of ostrich eggshell fragments, including some burnt ones, and CCS artefacts between dolerite outcrops.	Low	GPB
687		S30 20 59.4 E19 32 12.8	An ephemeral artefact scatter on the edge of a pan. The material is unknown but might be hornfels. Although there are many ostrich eggshell fragments scattered along the pan margin here, there are none directly associated with these artefacts.	Very Low	GPC
688		S30 20 43.6 E19 29 32.8	A scatter of ostrich eggshell fragments, including one showing evidence of having been struck from the outer surface, located between boulders on a dolerite outcrop.	Very Low	GPC
689		S30 20 22.5 E19 29 36.4	A scatter of ostrich eggshell fragments and CCS artefacts as well as one burnt bone on a dolerite outcrop. They occur alongside and minimally inside a tiny enclosure built with dolerite blocks. The floor space is no more than 1m (W-E) by 2m (N-S) and the opening is towards the north.	Low-Medium	GPA
690		S30 20 21.8 E19 29 34.3	A low density scatter of CCS artefacts.	Very Low	GPC
691		S30 19 58.0 E19 30 26.3	An ephemeral scatter of CCS artefacts.	Very Low	GPC
692		S30 20 14.8 E19 30 37.7	A dolerite outcrop with plenty of ostrich eggshell on and around it but no stone artefacts were seen.	Very Low	GPC
693		S30 20 14.9 E19 30 38.1	A dolerite outcrop with plenty of ostrich eggshell and some CCS artefacts on and around it.	Low	GPB
694		S30 19 57.7 E19 30 51.0	A scatter of ostrich eggshell fragments, including some burnt pieces, on a dolerite outcrop.	Very Low	GPC

Waypoint		GPS	Description	Significance [mitigation]	Field rating
695		S30 20 12.9 E19 28 07.0	The farmstead on Portion 2 of Farm 214. It has a modern house (maybe 1970s) as well as a shed that is likely to be early 20th century and a mud brick house ruin that may be late 19th century. The ruin has wooden door and window frames, some muurkaste, and bamboo ceiling which has collapsed. The roof poles seem to have been removed for reuse elsewhere. The house stands on a stone plinth. There is a very good chance that it was originally a brakdak house.	Medium **Avoid**	IIIB
696		S30 20 11.4 E19 28 04.0	This is the dump associated with the house ruin. It has a mixture of late 19th/early 20th century and later 20th century materials. There is a fairly low density of cultural materials.	Medium-Low **Avoid**	GPA
697		S30 22 13.0 E19 28 05.0	An area with an elevated density of background scatter alongside a pan/watercourse. The artefacts are of orange-coloured chert.	Very Low	GPC
698		S30 22 45.2 E19 28 46.9	A small scatter of LSA white CCS artefacts on a hilltop and overlooking a pan/watercourse to the north. There are about 25 artefacts.	Low	GPB
699		S30 22 41.3 E19 27 49.7	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert.	Very Low	GPC
700		S30 22 53.1 E19 27 28.3	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert. The south-western part of the study area seems to have this gravel and these artefacts far more than anywhere else on site.	Very Low	GPC
701		S30 21 21.8 E19 28 01.7	A scatter of ostrich eggshell fragments as well as some bone and one CCS artefact on a dolerite outcrop.	Low	GPB
702		S30 21 17.9 E19 27 50.1	An ephemeral scatter of ostrich eggshell fragments and some CCS on a dolerite outcrop.	Very Low	GPC
703		S30 21 18.6 E19 28 13.5	A scatter of ostrich eggshell fragments on a large dolerite outcrop (c. 40x30m).	Medium-Low	GPA
704		S30 21 18.8 E19 28 14.1	A scatter of ostrich eggshell fragments and CCS artefacts on the same dolerite outcrop.		
705		S30 21 18.5 E19 28 14.6	Dense scatter of ostrich eggshell fragments with some stone artefacts in CCS, hornfels and quartzite located in a basin on the same dolerite outcrop.		
706		S30 21 19.3 E19 28 14.5	A large ostrich eggshell scatter (including some burnt pieces) and some stone artefacts in CCS, hornfels and 'other' on the southern slope of the dolerite outcrop.		
707		S30 21 18.8 E19 28 14.3	A scatter of ostrich eggshell fragments and artefacts of CCS and hornfels on the top of the dolerite outcrop.		
708		S30 21 18.8 E19 28 15.5	A large ostrich eggshell scatter and some stone artefacts in CCS, on the eastern slope of the dolerite outcrop.		
709		S30 22 26.2 E19 27 59.6	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert.	Very Low	GPC
710		S30 20 16.9 E19 29 55.3	A single grinding groove (very shallow groove) on a flat area of dolerite bedrock. There is also some ostrich eggshell around the outcrop.	Low	GPB
711		S30 20 15.5 E19 30 37.4	A widespread scatter of ostrich eggshell fragments on the southern side of a dolerite outcrop.	Very Low	GPC

Waypoint		GPS	Description	Significance [mitigation]	Field rating
712		S30 20 26.2 E19 30 52.1	A scatter of ostrich eggshell fragments and one tortoise bone alongside a small dolerite outcrop	Very Low	GPC
717		S30 23 10.9 E19 31 38.2	A large scatter of ostrich eggshell with CCS artefacts on a sandy dolerite hill. Includes a backed bladelet fragment.	Medium	IIIB
718		S30 23 10.4 E19 31 38.8	A large and very dense scatter of ostrich eggshell with CCS and hornfels artefacts on a sandy dolerite hill.		
719		S30 23 09.9 E19 31 37.2	A large scatter of ostrich eggshell with CCS artefacts on a sandy dolerite hill.		
720		S30 23 03.1 E19 31 26.8	An ephemeral scatter of CCS artefacts on the summit of a shale hill. [1941 is part of this site.]	Very Low	GPC
721		S30 23 09.7 E19 31 29.9	An area of slightly higher density background scatter.	Very Low	GPC
722		S30 23 06.5 E19 30 54.5	A huge scatter of ostrich eggshell fragments and some CCS and hornfels artefacts on the side of a dolerite soil hill. Also some burnt ostrich eggshell fragments. [1937 and 1938 are part of this site.]	Medium-Low	GPA
723		S30 23 35.8 E19 29 54.5	Elevated density background scatter of red/orange CCS artefacts.	Very Low	GPC
724		S30 23 27.7 E19 29 46.3	An outcrop of milky-coloured CCS. Not obviously flaked but there are blocks of it around the area that are worked. Also some flakes.	Very Low	GPC
725		S30 23 26.3 E19 29 41.3	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
726		S30 23 26.1 E19 29 40.0	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
727		S30 23 24.9 E19 29 39.9	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
728		S30 23 20.0 E19 29 41.9	An outcrop of milky-coloured CCS. Not obviously flaked but there are blocks of it around the area that are worked. Also a number of flakes.	Low	GPB
729		S30 22 20.7 E19 31 51.4	A scatter of white CCS artefacts on a hilltop. There are many artefacts, including a backed bladelet and a backed point. There are also ostrich eggshell fragments.	Medium-Low	GPA
730		S30 22 20.4 E19 31 53.9	A scatter of green bottle glass, one pink glass fragment, one clear glass fragment, one metal item of unknown function (looks like silver or similar and is untarnished) and also a piece of a harmonica.	Very Low	GPC
731		S30 22 23.5 E19 32 58.3	An ephemeral scatter of CCS artefacts on a hilltop.	Very Low	GPC
080		S30 19 11.4 E19 31 56.1	A scatter of ostrich eggshell fragments and some CCS artefacts on the south side of a dolerite outcrop. Also an upper grindstone on a dolerite cobble.	Low	GPB
081		S30 20 01.8 E19 31 31.0	A scatter of ostrich eggshell fragments on a dolerite outcrop.	Very Low	GPC
082		S30 20 05.8 E19 31 38.0	A scatter of ostrich eggshell fragments on a dolerite outcrop. A CCS flake was seen at the base of the outcrop to the east.	Very Low	GPC

Waypoint		GPS	Description	Significance [mitigation]	Field rating
090		S30 21 08.9 E19 32 13.2	A scatter of ostrich eggshell fragments and some CCS artefacts on the south-western margin of a large pan.	Low	GPB
091		S30 20 40.2 E19 29 30.9	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop.	Low	GPB
092		S30 20 41.5 E19 29 26.4	A scatter of ostrich eggshell fragments among the boulders on a dolerite outcrop.	Very Low	GPC
096		S30 20 29.0 E19 29 14.2	A scatter of ostrich eggshell fragments and some CCS artefacts on the south side of a dolerite outcrop.	Low	GPB
100		S30 20 29.7 E19 29 16.2	A scatter of ostrich eggshell fragments and a single CCS flake.	Low	GPB
101		S30 19 42.1 E19 31 00.5	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop.	Low	GPB
103		S30 19 42.0 E19 31 00.9	A scatter of green bottle glass near a dolerite outcrop. Likely all from one bottle.	Very Low	GPC
104		S30 19 40.5 E19 31 00.5	A scatter of ostrich eggshell fragments on the southern side of a dolerite outcrop.	Very Low	GPC
115		S30 22 35.1 E19 28 50.5	An area with an elevated density of background scatter alongside a pan/watercourse. The artefacts are of orange-coloured chert.	Very Low	GPC
117		S30 22 21.8 E19 29 25.8	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop. Also some background scatter here.	Low	GPB
123		S30 23 48.6 E19 30 52.6	A light scatter of CCS artefacts.	Very Low	GPC
124		S30 23 52.8 E19 30 52.6	An area with an elevated density of background scatter.	Very Low	GPC
126		S30 23 42.2 E19 29 57.2	A light scatter of CCS artefacts.	Very Low	GPC
1926		S30 20 39.4 E19 34 18.7	Scatter of ostrich eggshell fragments about 30 m in diameter. There were rare quartz artefacts associated (4 flakes seen).	Very low	GPC
1927		S30 20 36.0 E19 34 16.5	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC
1928		S30 20 34.0 E19 34 20.0	An ephemeral scatter of ostrich eggshell fragments with a single crypto-crystalline silica flake.	Very low	GPC
1929		S30 20 33.4 E19 34 24.7	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC
1930		S30 20 36.3 E19 34 30.7	A scatter of refined white earthenware fragments. Two vessels represented, both transfer printed, one with blue and the other brown.	Very low	GPC
1932		S30 20 31.1 E19 34 15.9	Scatter of ostrich eggshell fragments about 15 m in diameter with a single crypto-crystalline silica flake.	Very low	GPC
1933		S30 19 22.3 E19 31 55.8	Scatter of ostrich eggshell fragments about 15 m in diameter. No artefacts were seen.	Very low	GPC
1934		S30 21 00.2 E19 32 10.0	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC

Waypoint		GPS	Description	Significance [mitigation]	Field rating
1935		S30 21 06.0 E19 32 08.4	Scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen.	Very low	GPC
1936		S30 24 21.5 E19 27 52.9	An ephemeral scatter of stone artefacts on the top of a scarp. 3 in CCS, 1 in silcrete, 2 ostrich eggshell fragments. Also 2 hornfels flakes a short distance away.	Very low	GPC
1937		S30 23 05.0 E19 30 53.3	Scatter of ostrich eggshell fragments about 15 m in diameter. No artefacts were seen. [Part of site 722.]	Very low	GPC
1938		S30 23 05.0 E19 30 53.6	Scatter of ostrich eggshell fragments about 20 m in diameter. A number of artefacts in CCS and hornfels were seen but it is hard to see artefacts among the shale gravel and there are likely more. Some of them are background scatter artefacts. [Part of site 722.]	Medium-Low	GPA
1939		S30 23 05.9 E19 30 54.5	Scatter of ostrich eggshell fragments about 20 m in diameter. A number of artefacts in CCS and hornfels were seen but it is hard to see artefacts among the shale gravel and there are likely more. Some of them are background scatter artefacts. [Part of site 722.]	Medium-Low	GPA
1940		S30 23 06.9 E19 30 55.2	Scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen. [Part of site 722.]	Very low	GPC
1941		S30 23 03.1 E19 31 26.3	Scatter of ostrich eggshell fragments about 10 m in diameter with a few CCS artefacts. [Part of 720.]	Very low	GPC
1942		S30 23 03.7 E19 31 34.9	Ephemeral scatter of ostrich eggshell fragments around a dolerite boulder that looks like it was used as a lower grindstone.	Very low	GPC
520		S30 19 52.4 E19 27 52.1	A dense scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen.	Very low	GPC
521		S30 19 54.8 E19 28 20.5	Ephemeral LSA scatter of CCS artefacts (8 flakes seen).	Very low	GPC
522		S30 23 50.0 E19 28 10.5	Ephemeral scatter of ostrich eggshell fragments and three CCS flakes.	Very low	GPC
523		S30 23 48.4 E19 28 09.9	Ephemeral scatter of CCS artefacts. One core and nine flakes seen.	Very low	GPC
524		S30 23 46.5 E19 28 09.3	Ephemeral scatter of ostrich eggshell fragments with two CCS flakes and an upper grindstone/hammerstone on a sandstone-like cobble.	Very low	GPC

6.5.2 Impact assessment with mitigation measures

It is anticipated that the construction activities related to the proposed Kokerboom 3 Wind Farm and associated infrastructure may cause damage or destruction to the archaeological artefacts identified by the heritage specialist, or to potential artefacts that are underground.

The alteration of the cultural landscape has been assessed in the visual section below (Section 6.8.2) and the perspective of the heritage specialist has been included there.

Table 6-22 | Impacts to archaeological resources

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Damage to or destruction of archaeological sites and artefacts due to construction of turbines, access roads and related infrastructure.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Site specific	
Intensity	Moderate		Very low	
Duration	Long Term		Long Term	
Significance	**Moderate (-)/Medium**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	Irreversible		Irreversible	
Mitigation measures				
• The grade GPA archaeological site at waypoints 722, 1938 and 1939 will require archaeological mitigation in the form of sampling and collection. • 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. • 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. 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). • Restrict all construction activities to the demarcated project footprint. • Educate construction staff to understand the importance of remaining within the authorised footprints for all roads, turbine placements and other aspects of the development. • 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.				

Table 6-23 | Impacts to the cultural landscape

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Impacts to the cultural landscape would occur during all three phases and would relate to the presence of very tall industrial-type structures in a landscape that is otherwise gently undulating and distinctly rural and/or natural in character.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Low		Low	
Duration	Long Term		Long Term	
Significance	**Minor (-)/Low**		**Minor (-)/Low**	

Probability	Definite	Definite
Confidence	Sure	Sure
Reversibility	Irreversible	Irreversible
Mitigation measures		
• No mitigation is possible because of the sheer size of the turbines. They cannot be screened or placed in such a way as to be less visible from surrounding roads and structures.		

6.5.3 No-go alternative

With implementation of the No-Go alternative the site would remain in its present state, no heritage resources would be directly impacted and natural degradation through erosion, weathering (rain and wind) and trampling (by animals and vehicles) would continue to occur.

6.5.4 Heritage impact statement

Given that known significant impacts have been avoided in the site layout or can be easily mitigated and the chances of highly significant impacts occurring are negligible, it is the opinion of the present specialist that the proposed Kokerboom 3 WEF should be authorised in full.

The final layout was subjected to a detailed survey (walkdown) carried out in June 2021 and it was confirmed that no heritage resources will be impacted. It is thus proposed that the project be allowed to proceed. However, the following condition should be included as part of the authorisation should one be issued:

- 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 if necessary. 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.

6.6 Socio-economic Context

The socio-economic context of a project includes both the environment at the site as well as the policy and planning framework which was described in Chapter 2 and Section 5.2 above. As the nature of renewable energy is likely to have a large impact on the receiving social environment for a minimum period of approximately 20 years, a social specialist was appointed to undertake a social impact assessment (SIA). Tony Barbour and Schalk van der Merwe of Tony Barbour Environmental Consulting and Research provided a detailed SIA (included in Annexure D) which considered both the existing literature and statistics on the study area as well as a number of interviews conducted with affected landowners. General observations made on site and experience with similar projects in the general area also provided information for the study.

6.6.1 Description of the socio-economic environment

The proposed Kokerboom 3 Wind Farm is located within the Namakwa DM of the Northern Cape Province. Namakwa DM is bordered by the Siyanda and Pixley ka Seme DMs to the northeast and east, respectively. To the south, the Western Cape Districts of the West Coast, Boland and Central Karoo are found.

The Hantam LM is one of six municipalities in the Namakwa DM. Hantam LM was named after a Khoi name that means "*mountains where the bulbs grow*" after the Hantam Mountains in the area. The administrative centre of the municipality is in the town of Calvinia.The project site is located in the

Northern Cape Province, which is the largest province in South Africa and covers an area of 361 830 km^2 and constitutes approximately 30% of South Africa. The province is divided into five district municipalities, namely the Frances Baard, John Taolo Gaetswe, Namakwa, Pixley ka Seme and ZF Mgcawu District Municipalities.

Land use

Ninety six percent (96%) of the land is used for stock farming, including beef cattle and sheep or goats, as well as game farming in the Northern Cape. Food production and processing for the local and export market is also growing significantly. The wind farm itself is primarily used for agriculture in the form of sheep farming. Other land uses within the surrounding area include the Eskom Helios substation, which is located adjacent to the Granaatboskolk (Nuwepos) Road, approximately 7.5 km south-east of the Kokerboom 3 site. The operational Khobab and Loeriesfontein Wind Farms connect to Helios via 132kV overhead powerlines. Sishen-Saldanha railway line is located 4.3 km to the east of Kokerboom 3. Three large salt pans, Konnes se Pan, Dwaggas Salt Pan and Commissioner's Salt Pan, are located 15-25 km to the north and north east of the Kokerboom 3 site.

Kokerboom 3 is one of thirteen Renewable Energy Facilities (REF) currently proposed or under construction in the study area, inclusive of two operational WEFs (Khobab and Loeriesfontein 2).

6.6.1.1 Demographics

The Hantam LM had a population of 21 505 in 2017, which is a decrease from the 2011 population (21 685). The number of households in the Hantam LM was estimated at 6 196 in 2017, with an average household size of 3.5. A large percentage (82.2%) of the population in the HLM is coloured, followed by whites (12.1%) and black africans (4.4%). (Census, 2011). This is contrasted with the information provided by the municipal 2017 IDP, coloured (83.4%), followed by whites (11.7%) and black africans (4.9%). The dominant language within the municipality is Afrikaans (93.1%), followed by the other languages spoken including English (1%) and Xhosa (0.6%). (Census, 2011).

6.6.1.2 Employment and Sectors

HLM unemployment rate has decreased for the ten-year period between 2001 and 2011 period from 19.8%, a drop of 7.9%. the unemployment rate in 2017 was 10.3%. The decrease in the unemployment rate is a direct result of the renewable energy sector growth within the region, specifically the town of Loeriesfontein.

Mining and agriculture forms the backbone of the greater Namakwa District, with diamond and copper mining being the primary commodities being extracted. Mining activities have since declined in the last two decades, leading to massive layoffs and disinvestment in the DM. Another key sector is agriculture and agri-processing, especially within the Northern Cape Province. Approximately 2% percent of the province is used for crop farming, mainly irrigation in the Orange River Valley and Vaalharts Irrigation Scheme.

Agriculture and small-scale salt mining are traditionally the key economic activities in the study area. The key - and essentially only - agricultural resource in the study area is grazing. The resource is almost exclusively used for sheep farming.

6.6.1.3 Educational Levels

The education levels in the HLM improved for the period 2001 to 2011, with the percentage of the population over 20 years of age with no schooling decreasing from a high 26.8 % to 15.3 %. While there has been a significant improvement the figure for the HLM was higher than the provincial average of 11.3 %. The percentage of the population over the age of 20 with matric also increased in the HLM, from 14.9% to 18.8% in the HLM. Despite these increases the figure are significantly lower than the provincial

(27.7%) and national (28.4%) averages. Low education levels, specifically higher education, therefore, remains a challenge in the HLM.

6.6.1.4 Availability of Services

In terms of services offered, Loeriesfontein, the nearest town in the Hantam LM, houses one police station, one hospital, one medical clinic, and two educational facilities. Despite the low numbers of service venues, the Department of Health has a number of awareness programmes in the area including daily HIV counselling and testing and daily tuberculosis (TB) screening. The municipal area currently has 300 HIV positive patients and 60 TB patients per month. More localised statistics to the site were Impact assessment with mitigation measures

The potential socio-economic impacts associated with the proposed Kokerboom 3 Wind Farm are a mix of positive and negative impacts. The project is likely to benefit the local community and measures to enhance these benefits should be implemented. The addition of up to 300MW of renewable electricity generated from the wind farm will also contribute to the energy security of South Africa.

The positive impact assessed below include the following during construction phase:

- Creation of direct and indirect employment and business opportunities, and the opportunity for skills development and on-site training (+);

However negative social impacts are also anticipated to occur with the development of the WEF. These may include the following during construction phase:

- Impacts associated with the presence of construction workers on site and in the area (-);
- Influx of job seekers to the area (-);
- Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with the presence of construction workers on site (-);
- Increased risk of grass fires (-);
- Impact of construction related activities, including damage to roads, noise, safety and dust (-);
- Potential loss of productive grazing associated with construction-related activities (-)

Potential positive impacts identified during operational phase include the following:

- Establishment of renewable energy infrastructure (+);
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training (+);
- Generate income for affected landowners (+);
- Benefits associated with the establishment of a Community Trust (+); and
- The establishment of renewable energy infrastructure (+).

Potential negative impacts identified during operational phase include the following:

- The visual impacts and associated impact on sense of place (-) (This is discussed and assessed by the Visual Specialist
- Impact on property values and operations (-); and
- Impact on tourism (-).

Potential negative impacts identified during the decommissioning phase include the following:

- Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income (-).

Table 6-24 | Creation of employment and business opportunities

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Creation of employment and business opportunities during the construction phase. The construction phase is expected to extend over a period of ~ 18 months and create approximately 300 employment opportunities during peak construction. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the WEF and the associated components, including, access roads, substation, services and power line. Based on information provided by the proponent it is anticipated that approximately 60% (180) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (90) to semi-skilled workers (drivers, equipment operators etc.) and 10% (30) for skilled personnel (engineers, land surveyors, project managers etc.).			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Positive		Positive	
Extent	Regional		Regional	
Intensity	Medium		High	
Duration	Construction Period		Construction Period	
Significance	**Moderate (+)/Medium**		**Major (+)/High**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Reversible		Reversible	
Mitigation measures (enhancement)				
Employment: • 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. • Where feasible, efforts should be made to employ suitably qualified and experienced local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. • 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. • 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. • 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. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business:** • 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; • 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.				

Table 6-25 | Impacts associated with the presence of construction workers on site and in the area

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Potential impacts on family structures and social networks associated with the presence of construction workers. The presence of construction workers poses a potential risk to family structures and social networks in the town of Loeriesfontein and potentially Calvinia, Niewoudtville and other nearby towns. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour including: • An increase in alcohol and drug use; • An increase in crime levels; • The loss of girlfriends and/or wives to construction workers; • An increase in teenage and unwanted pregnancies; • An increase in prostitution; and • An increase in sexually transmitted diseases (STDs), including HIV.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Medium		Low	
Duration	Construction Period		Construction Period	
Significance	**Moderate (-)/Medium**		**Minor (-)/ Low**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Irreversible for individuals who are affected by STDs (specifically HIV/Aids), and unplanned/ unwanted pregnancies, etc.		Irreversible for individuals who are affected by STDs (specifically HIV/Aids), and unplanned/ unwanted pregnancies, etc.	
Mitigation measures				
• 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. • 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. • 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. • The proponent and contractor(s) should implement an HIV/Aids awareness programme for all construction workers at the outset of the construction phase. • No workers should be permitted to trespass onto adjacent properties. Failure to adhere to this should be made a dismissible offence. • In the event of workers being accommodated in Loeriesfontein or anther remote location off site, the contractor should provide transport to and from the site on a daily basis for workers. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.			

- 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.
- The need and feasibility of establishing accommodation on site should be assessed by the proponent.
- 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.

Table 6-26 | Influx of job seekers

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it's temporary. These job seekers can become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way they conduct themselves can impact on the local community. Experience from large projects has also shown that the families of job seekers may also accompany individual job seekers or follow them later. The influx of job seekers to the area and their families can also place pressure on the existing services in the area, specifically low-income housing. In addition to the pressure on local services, the influx of construction workers and job seekers can also result in competition for scarce employment opportunities. Further secondary impacts include increase in crime levels, especially property crime, as a result of the increased number of unemployed people. These impacts can result in increased tensions and conflicts between local residents and job seekers from outside the area.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Low		Low	
Duration	Construction Period		Construction Period	
Significance	**Minor (-)/ Low**		**Minor (-)/Low**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Irreversible for individuals who are affected by STDs, specifically HIV/AIDS, and unplanned / unwanted pregnancies etc.		Irreversible for individuals who are affected by STDs, specifically HIV/AIDS, and unplanned / unwanted pregnancies etc.	
Mitigation measures				
• The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities. • The proponent should implement a policy that no employment will be available at the gate.				

Table 6-27 | Risk to safety of farmers and farm workers, livestock and damage to farm infrastructure

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	The presence of and movement of construction workers on and off the site may pose a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged or stock theft linked either directly or indirectly to the presence of farm workers on the			

	site. The findings of the SIA indicated that stock theft is not currently an issue. This is largely associated with the distance from towns, and the fact that site properties are essentially only accessible via one road (Klein Rooiberg to Struiskom), accessed off the Nuwepos Road. The road essentially carries no through traffic. While none of the property owners indicated that stock theft was an issue, they did indicate that the presence of construction workers on the site increased the exposure of their farming operations and livestock to the outside world, which, in turn, could increase the potential risk of stock theft and crime. The local farmers did, however, indicate that the potential risks (safety, livestock and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on the site workers during the construction phase.

	Pre-Mitigation	Post-Mitigation
Type	Negative	Negative
Extent	Local	Local
Magnitude	Low	Low
Duration	Construction Period	Construction Period
Significance	**Moderate (-)/Medium**	**Minor (-)/Low**
Probability	Probable	Probable
Confidence	Certain	Certain
Reversibility	Irreversible for individuals who are affected by serious crimes	Irreversible for individuals who are affected by serious crimes

Mitigation measures (enhancement)

- 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. The relevant agreement/s should be signed before the construction phase commences;
- 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;
- 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;
- 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;
- 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);
- 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;
- 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;
- 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.

Table 6-28 | Increased risk of grass fires

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could in turn pose a threat to grazing and livestock in the area. Due to low biomass, the veld is not very fire prone. However, should a fire occur, it would deprive the affected landowners of their primary grazing resource. Given the low carrying capacity of the veld, any loss of valuable grazing land would impact on farming livelihoods. Farm infrastructure, such as fences and water pipes, may also be damaged or destroyed. The risk of grass fires is higher during windy conditions in the area, specifically during the dry hot summer months from December to March. The potential risk of grass fires can be effectively addressed by implementing the mitigation measures listed below.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Medium		Low	
Duration	Construction Period		Construction Period	
Significance	**Moderate (-)/Medium**		**Minor (-)/Low**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Reversible		Reversible	
Mitigation measures				

- 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. The agreement should be signed before the construction phase commences. In addition, the landowners should be encouraged to join the local Fire Protection Association;
- Contractor/s should ensure that no open fires are allowed on the site;
- 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;
- 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 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.

Table 6-29 | Impact of construction related activities, including damage to roads, noise, safety and dust

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	The movement of heavy construction vehicles during the construction phase has the potential to damage local farm roads and create dust and safety impacts for other road users in the area. The project components are likely to be transported to the site via the N7. The N7 provides the key link between the Western Cape and Namibia and is an important commercial and tourist route. The transport of components of the WEF to the site therefore has the potential to impact on other road users travelling along the N7. Measures will need to be taken to ensure that the potential impact on motorist using the N7 is minimised. The other roads that may be impacted include the R 27 and the R 357.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Medium		Low	
Duration	Construction Period		Construction Period	
Significance	**Moderate (-)/Medium**		**Minor (-)/Low**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Reversible		Reversible	
Mitigation measures				
• 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. • 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 must ensure that damage caused by construction related traffic to the Nuwepos 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; • 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; • The Contractor should liaise with the affected farmers regarding timing and location of construction activities so they can make alternative arrangements for their sheep; • 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; • The Contractor should be required to collect waste along the access road on a weekly basis; • Waste generated during the construction phase should be transported to the local landfill site or other appropriate recycling/disposal facility.				

Table 6-30 | Loss of grazing resources

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	The activities associated with the construction phase, such as road construction, establishment of laydown areas, construction camps, and turbine foundations are likely to result in the loss of land available for grazing and other agricultural activities.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Site Specific		Site Specific	

Intensity	Medium	Low
Duration	Construction Period	Construction Period
Significance	**Moderate (-)/Medium**	**Minor (-)/Low**
Probability	Probable	Probable
Confidence	Certain	Certain
Reversibility	Reversible	Reversible
Mitigation measures (enhancement)		
• 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. • An ECO should be appointed to monitor the establishment of the 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. • The implementation of a rehabilitation programme should be included in the terms of reference for the contractor(s) appointed. • The implementation of the Rehabilitation Programme should be monitored by the ECO.		

Table 6-31 | Establishment of renewable energy infrastructure

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	The establishment of renewable energy infrastructure, such as the proposed WEF, should be viewed, firstly within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Positive		Positive	
Extent	Site Specific		Site Specific	
Intensity	Low		Medium	
Duration	Long Term		Long Term	
Significance	**Moderate (-)/Medium**		**Moderate (+)/Medium**	
Probability	Definite		Definite	
Confidence	Certain		Certain	
Reversibility	N/A		N/A	
Mitigation measures (enhancement)				
• Use the project to promote and increase the contribution of renewable energy to the national energy supply; • 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.				

Table 6-32 | Creation of employment and business opportunities

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	The employment opportunities associated with the operational phase will be limited to in the region of 20 full-time employees over a 20-year period. Of this total approximately 10 will be highly skilled, 8 semi-skilled and 2 low skilled positions. The			

Phase	Pre-Construction	Construction	Operational	Decommissioning
	annual wage bill for the operational phase would be ~ R 5 million. The majority of semi-skilled and low-skilled employment opportunities associated with the operational phase are likely to benefit HD members of the community. However, given that the wind energy sector in South Africa is relatively new, the skilled positions may need to be filled by people from other parts of South Africa or even overseas.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Positive		Positive	
Extent	Regional		Regional	
Intesnity	Low		Medium	
Duration	Long Term		Long Term	
Significance	**Minor (+)/Low**		**Moderate (+)/Medium**	
Probability	Definite		Definite	
Confidence	Certain		Certain	
Reversibility	N/A		N/A	
Mitigation measures (enhancement)				
• Where possible and feasible, the proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase (unless sufficient suitably skilled persons are already available in the local area). The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project. • The proponent, in consultation with the HLM, should investigate the options for the establishment of a Community Development Trust				

Table 6-33 | Generation of income for affected landowners

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	The proponent has entered into rental agreements with the affected landowners for the use of the land for the establishment of the proposed WEF. In terms of the rental agreement the affected landowner(s) will be paid an annual amount dependent upon the number of wind turbines located on the property. Based on the findings of the SIA the agricultural carrying capacity of the farms in the area is low, and, as a result, stocking levels are low. Sheep farming is essentially the only farming activity and these operations are marginal. The area is also prone to droughts. Any additional source of income therefore represents a significant benefit for the affected landowner(s). The additional income reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Positive		Positive	
Extent	Site Specific		Site Specific	
Intensity	Low		Medium	
Duration	Long Term		Long Term	
Significance	**Minor (+)/Low**		**Moderate (+)/Medium**	
Probability	Definite		Definite	
Confidence	Certain		Certain	
Reversibility	N/A		N/A	
Mitigation measures (enhancement)				

Phase	Pre-Construction	Construction	Operational	Decommissioning
• The relevant lease agreements between the proponent and landowners must be put in place and signed off prior to commencement.				

Table 6-34 | Benefits associated with the establishment of a Community Trust

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	An important focus of the REIPPPP is to ensure that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. In this regard IPPs are required to contribute a percentage of projected revenues accrued over the 20-year project operational life toward SED initiatives. These contributions are linked to Community Trusts and accrue over the 20-year project operation life and are used to invest in housing and infrastructure as well as healthcare, education and skills development. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20-year period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including: • Creation of jobs; • Education; • Support for and provision of basic services; • School feeding schemes; • Training and skills development; and • Support for SMME's.			
	Pre-Mitigation		**Post-Mitigation**	
Type	Positive		Positive	
Extent	Regional		Regional	
Magnitude	Low		High	
Duration	Long Term		Long Term	
Significance	**Moderate (+)/Medium**		**Major (+)/High**	
Probability	Definite		Definite	
Confidence	Certain		Certain	
Reversibility	N/A		N/A	
Mitigation measures (enhancement)				
• 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. • Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. • Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.				

Table 6-35 | Potential impact on property values

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	The potential impact on property values was not identified nor raised as a key issue. In addition, based on the findings of the literature review the impact of a WEF in a remote, rural area, such as the proposed site, is unlikely to have an impact on property values. In this regard the Urbis (2016) study in New South Wales, Australia, noted that "appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values". There are also no sensitive receptors, such as eco-lodges, located in the vicinity of the proposed WEF that would be impacted. It is therefore reasonable to assume that the potential impact on adjacent property values is likely to be negligible to low.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Very Low		Very Low	
Duration	Long Term		Long Term	
Significance	**Minor (-)/Low**		**Minor (-)/Low**	
Probability	Definite		Definite	
Confidence	Sure		Sure	
Reversibility	Reversible		Reversible	
Mitigation measures				
• Implement the recommendations of the VIA.				

Table 6-36 | Potential impact on tourism

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Based on the findings of the SIA the contribution of tourism to the local economy is limited. The findings of the VIA note that there are no landscape based eco-tourism activities in the immediate area that would be impacted by the proposed WEF. The potential visual impacts associated with the proposed WEF are therefore unlikely to impact on existing tourism activities in the area. In addition, the findings of the review of international literature on the impact of wind farms (Section 2.6 of the SIA) note that the establishment of wind farms does not result in an overall decline in the number of tourists visiting an area or any overall financial loss in tourism-related earnings. The WEF may also create an opportunity for visitors to visit the area. However, given the remoteness of the area the significance is likely to be low.			
	Pre-Mitigation		**Post-Mitigation**	
Type	Negative and positive		Negative and positive	
Extent	Regional		Regional	
Magnitude	Very Low		Very Low	
Duration	Long Term		Long Term	
Significance	**Minor (-)/Low and**	**Minor (+)/Low**	**Minor (-)/Low and**	**Minor (+)/Low**
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Reversible		Reversible	

Mitigation measures
• Implement the recommendations of the VIA. • The proponent should consider the establishment of a visitor centre, should the proposed WEF be approved.

Table 6-37 | Loss of operational jobs and associated income due to decommissioning

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. It is possible that the decommissioning phase may involve the disassembly and replacement of the existing components with more modern technology, which would create additional (construction type) jobs. However, it is important to consider the worst-case scenario, which would therefore be the loss of jobs and associated income.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Medium		Very Low	
Duration	Short Term		Short Term	
Significance	**Moderate (-)/Medium**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Certain		Certain	
Reversibility	Reversible		Reversible	
Mitigation measures (enhancement)				
• The proponent should ensure that appropriate retrenchment packages are provided for all staff retrenched when the WEF is decommissioned. • All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning. • 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.				

6.6.2 No-go alternative

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producers of carbon emissions in the world, this would represent a negative social cost. However, at a provincial and national level, it should be noted that the proposed WEF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Northern Cape and other parts of South Africa. Foregoing the proposed

establishment of the proposed WEF would therefore not necessarily compromise the development of renewable energy facilities in the Northern Cape Province and/ or South Africa. However, the socio-economic benefits for the local communities in the HLM would be forgone. This loss should be viewed within the context of the area's low agricultural and tourism potential. The establishment of a WEF would therefore create a unique opportunity for investment in the area. The no-development option would therefore represent a negative socio-economic impact for the local area

6.6.3 Socio-economic impact statement

The findings of the SIA undertaken for the proposed 300 MW Kokerboom 3 WEF and associated BESS indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit socio-economic development in the area. The establishment of the 300 MW Kokerboom 3 WEF and associated BESS is therefore supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report and other key specialist studies as well as the EMPr (Annexure F).

6.7 Nuisance Impacts (Noise)

As introduced above in Section 0, noise impacts will be created by the construction and operation of the Kokerboom 3 Wind Farm. The potential noise impact associated with the construction, operation and decommissioning of the proposed Kokerboom 3 WEF was evaluated using a sound propagation model. Morne De Jager Enviro form Acoustic Research (EARES) compiled the specialist reports which is available in Annexure D.

6.7.1 Description of the environment

Land use is mostly wilderness (ecotourism) with agricultural activities. The area surrounding the proposed site consists predominantly of agricultural lands dominated by sheep farming activities. Existing land use activities are not expected to impact on the ambient sound levels. There are no major roads in the vicinity of the proposed Kokerboom 3 WEF, with the local community using the existing gravel roads to access their properties. There may be some increased traffic on the Granaatbos Kolk Road relating to operation of the Loeriesfontein and Khobab WEFs as well as the future construction of other renewable projects in the area.

There is a railway line around 10 km to the south, with a number of trains observed during the day. No trains were observed at night, though there exist insufficient data to conclude that trains only travel during the day.

The only dwelling in the area is located on the farm Struiskom (Karee Doorn Pan 2/214), which is currently only occupied seasonally / occasionally. Refer to Figure 6-14 which indicates the Noise Sensitive Development (NSD).(Please refer to Annexure I for a higher resolution map)

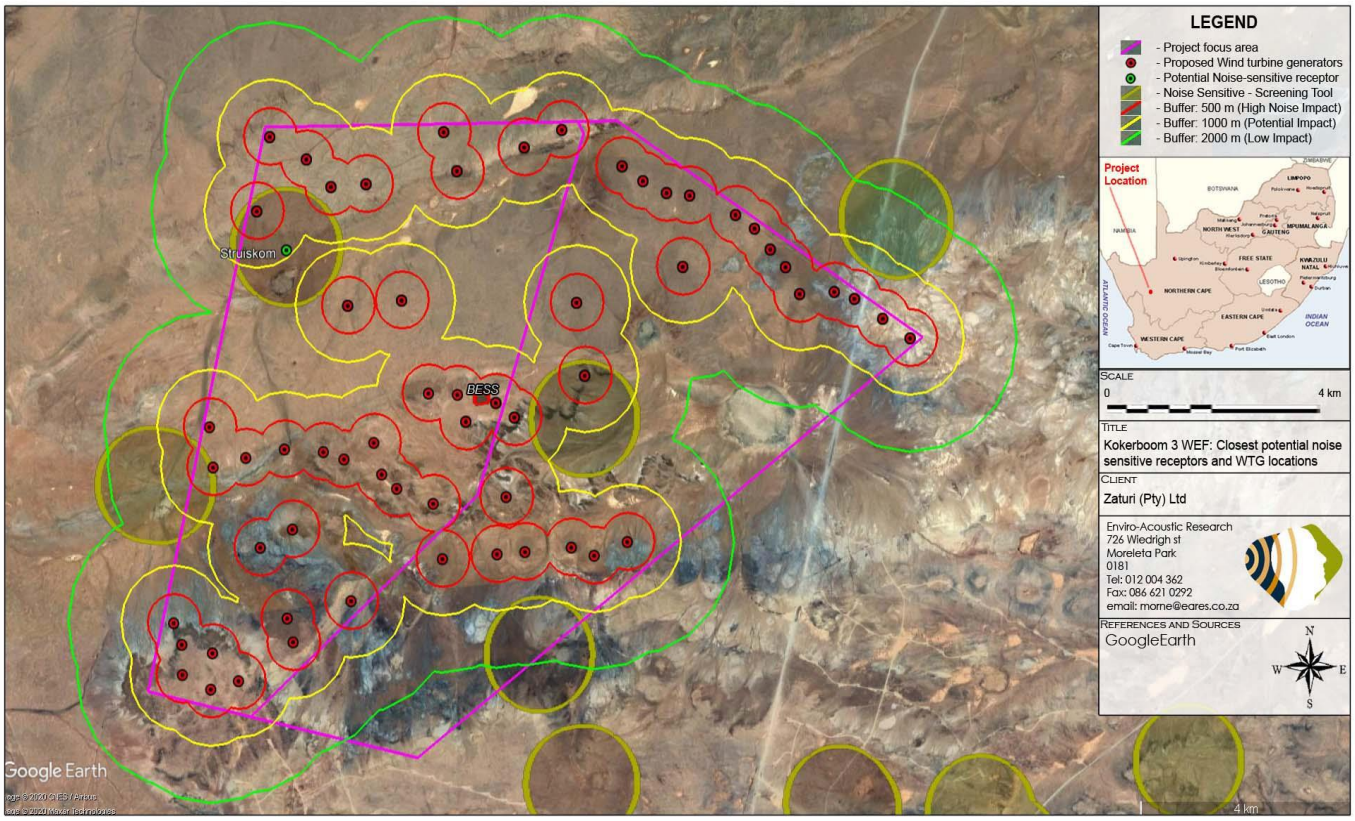


Figure 6-14 | Aerial Image indicating site sensitivity and closest identified Noise-sensitive developments

6.7.2 Impact assessment with mitigation measures

The nuisance impacts are likely to occur mostly during the construction phase as they are directly related to the construction activities. These include:

- Increase in construction noise during the day (-);
- Construction activities during at night (-);
- Construction of roads (-);
- Daytime construction traffic (-);
- Operational activities at night (-);.

Table 6-38 | Increase in construction noise during the day

Phase	Pre-Construction	**Construction**	Operational	Decommissioning
Impact description	Various construction activities taking place simultaneously during the day will increase ambient sound levels due to air-borne noise. Noise levels due to construction activities close to the NSD may be as high as 40 – 45 dBA, depending on the number of simultaneous activities taking place close to this receptor.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Low		Low	
Duration	Construction Period		Construction Period	
Significance	**Negligible (-)/Very Low**		**Negligible (-)/Very Low**	
Probability	Improbable		Improbable	
Confidence	Sure		Sure	

Phase	Pre-Construction	Construction	Operational	Decommissioning
Reversibility	High		High	
Mitigation measures				
• Significance of noise impact is very low for the scenario as conceptualized.				

Table 6-39 | Construction activities at night

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Various construction activities taking place simultaneously at night will increase ambient sound levels due to air-borne noise. Noise levels due to construction activities close to the NSD may be as high as 40 – 45 dBA, depending on the number of simultaneous activities taking place close to this receptor. Such an increased noise will be highly audible, potentially disturbing during the very quiet night-time periods.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Local	
Intensity	Very high		Medium	
Duration	Construction Period		Construction Period	
Significance	**Minor (-)Low**		**Negligible (-)/Very Low**	
Probability	Improbable		Improbable	
Confidence	Sure		Sure	
Reversibility	High		High	
Mitigation measures				
• 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.				

Table 6-40 | Construction of roads

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Construction of roads during the day may increase ambient sound levels temporary. Construction activities closer than 100 m from the identified NSD could result in noise levels exceeding 55 dBA, higher than the IFC recommended noise limits for residential use. Construction activities closer than 250 m from the identified NSD could result in noise levels exceeding 45 dBA, higher than the zone sound levels for a rural area. *(Note that all proposed Kokerboom 3 infrastructure is located >800m away from the NSD and thus no noise generating activities are expected within 250m of the NSD)*			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Very high		Very high	
Duration	Construction Period		Construction Period	

Phase	Pre-Construction	Construction	Operational	Decommissioning
Significance	**Negligible (-)/Very Low**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	High		High	
Mitigation measures				
• Significance of noise impact is very low for the scenario as conceptualized.				

Table 6-41 | Daytime construction traffic

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Various construction vehicles passing close to potential noise-sensitive receptors at may increase ambient sound levels and create disturbing noises.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Very high		Very high	
Duration	Construction Period		Construction Period	
Significance	**Negligible (-)/Very Low**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	High		High	
Mitigation measures				
• 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).				

Table 6-42 | Operational activities at night

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Wind turbines operating simultaneously at night. Increases in ambient sound levels due to air-borne noise from the wind turbines.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Low		Low	
Duration	Long		Long	
Significance	**Negligible (-)/Very low**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	High		High	
Mitigation measures				
• Significance of noise impact is low for the scenario as conceptualized.				

6.7.3 No-go alternative

The nuisance impacts are caused directly by the proposed project and would therefore not occur with the no-go alternative proceeding.

6.7.4 Environmental impact statement

The noise impacts associated with the proposed Kokerboom 3 Wind Farms are acceptable at a minor to negligence (-) significance. The proposed layout will result in increased noise levels at a single receptor. Considering the ambient sound levels measured on-site, the projected noise rating levels will be similar than the on-site ambient sound levels. The project will greatly assist in the provision of energy, which will allow further economic growth and development in South Africa and locally. The project will generate short and long-term employment and other business opportunities and promote renewable energy in South Africa and locally. People in the area that are not directly affected by increased noises generally have a more positive perception of the renewable projects and understand the need and desirability of the project. Noise sensitive areas are identified in Figure 6-15 below.

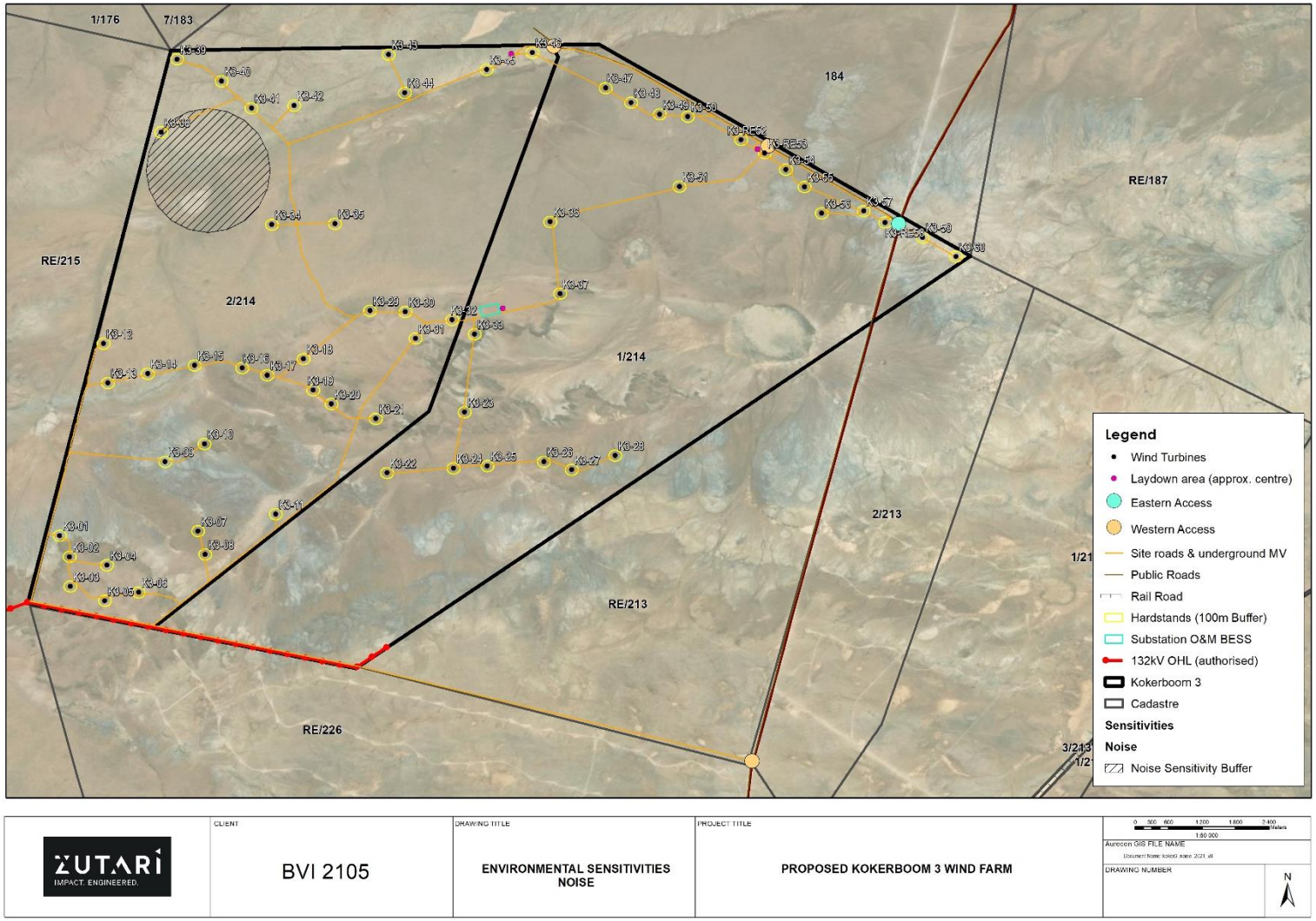


Figure 6-15 |Noise No-Go areas within the footprint of the proposed Kokerboom 3 Wind Farm

6.8 Visual Landscape

The turbines proposed for the Kokerboom 3 Wind Farm will have a hub height of up to 150m, with an additional blade length of 90m (180m rotor diameter). The turbine may therefore reach of a height of up to 240m. Such a tall structure will therefore present a significant change to the landscape and a visual impact assessment was therefore undertaken.

Mr Stephen Stead of Visual Resource Management (VRM) Africa was appointed to undertake a visual specialist report that has been included in Annexure D. Mr Stead's report was informed by a site visit (10 March 2020), a literature review, a modelling exercise and an impact assessment.

The visible extent, or viewshed, is defined as "*the outer boundary defining a view catchment area, usually along crests and ridgelines*"[14]. To assess the proposed project visibility, a viewshed analysis was undertaken by the visual specialist. An indicative height of 240 m was used for the wind turbines which resulted in a probable zone of visual influence carrying 28 km.

This viewshed is only informative as visibility tends to diminish exponentially with distance. Photomontages were generated from photographs taken during the field survey were modified to reflect the expected landscape, making use of a 3D model generated for the proposed mining landscape modifications. The photomontages are not an exact replication and are ***provided for visualisation purposes only***. The photomontages are based on the maximum tip-height of 240m (Refer Figure 6-16 and Figure 6-17 below).

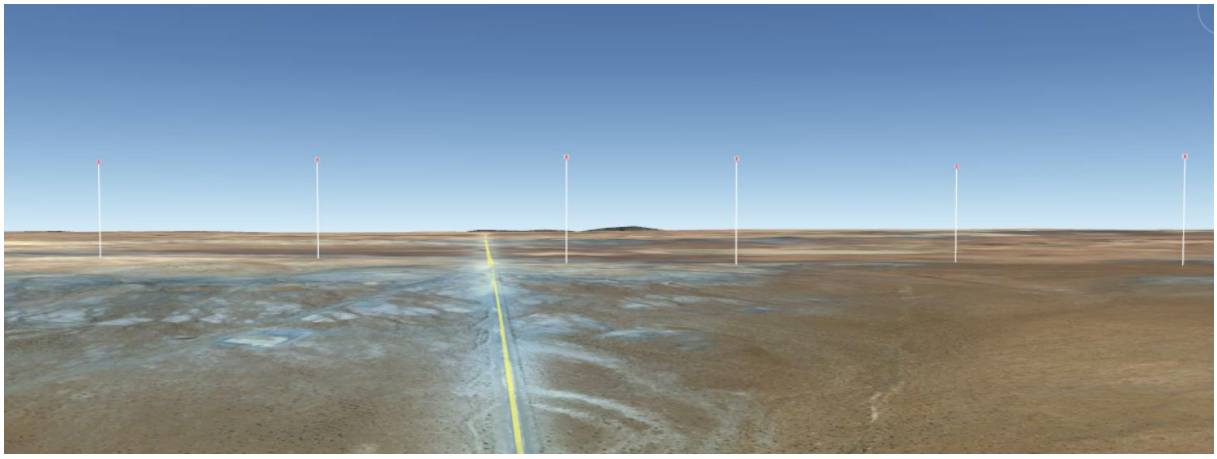


Figure 6-16 |Model proof using 3D Google Earth image of the 240m height of the turbines as seen from the Nuwepos Road travelling southbound.

[14] Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development.

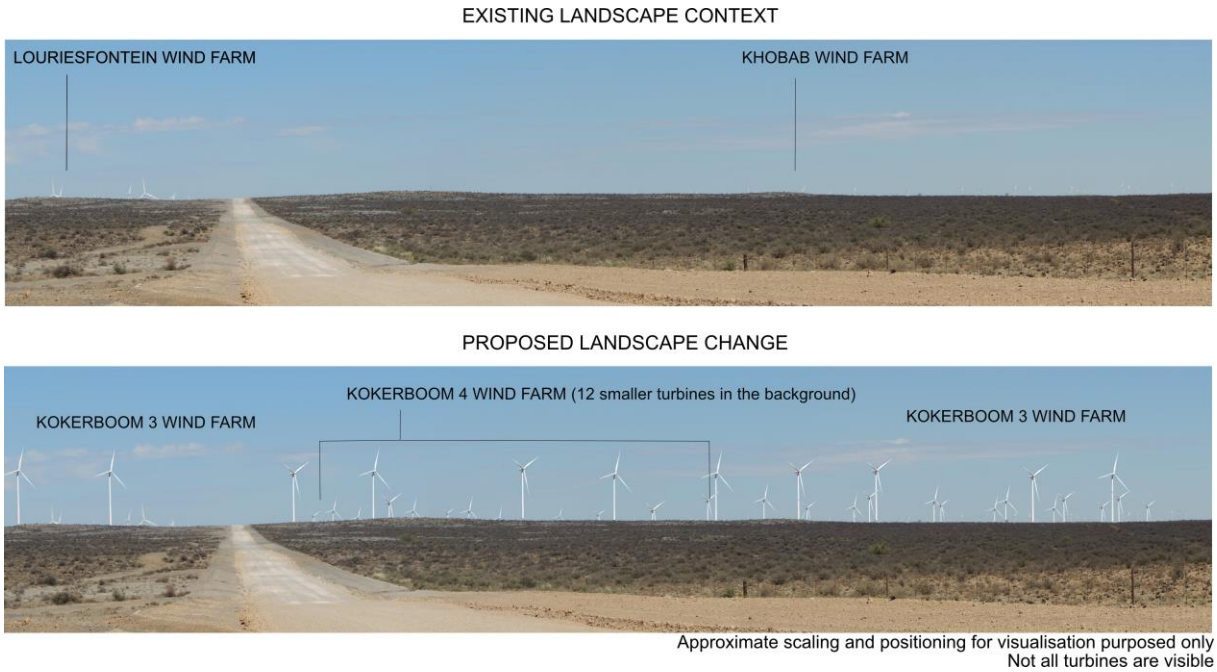


Figure 6-17 | Photomontage of the existing and proposed cumulative front and centre views as seen from the Nuwepos Road (2km from nearest wind turbine).

6.8.1 Description of the environment

At a regional level, there is some topographic variation, but in essence, the surrounding terrain is described as predominantly flat without key topographic features. The current land use of the proposed properties is agricultural, with low intensity sheep farming carried out in this arid environment.

In terms of the landscape setting, the only identifiable feature within the surrounding area is the Klein Rooiberg hill. Although the isolation of the hill does increase the visual importance of this landmark in the surrounding flat Nama-Karoo landscape, it is located approximately 22 km to the south of the proposed site.

The site land use is low intensity sheep farming carried out in the arid environment, some of the associated man-made modifications include isolated farmsteads, farm tracks, fences and water reservoirs. These features are small in scale in the landscape and do not detract from the sense of place, and only provide a baseline for the study area.

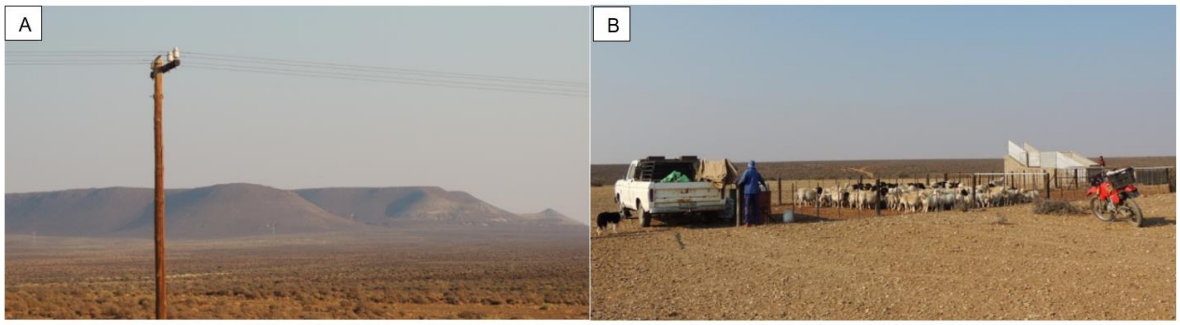


Figure 6-18 | Photograph of the Klein Rooiberg hill feature; B: Photograph taken approximately 5 km north of the project area depicting the low intensity sheep farming characteristic of the rural agricultural area

The vegetation type can be described as Bushmanland Basin Shrubland. The vegetation and landscape features are described as slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and sometimes also succulent) shrubs, white grasses and in years of high rainfall, also by abundant annuals. This is largely influenced by the arid area of low rainfall and high summer

temperatures. This results in a uniform broad-brush landscape that has a low visual absorption capacity. Other features include the Eskom Helios Substation, the Sishen-Saldanha railway line, 400 kV distribution line and the Granaatboskolk (Nuwepos) gravel road and numerous farm access roads have introduced a vertical component to the area. The infrastructure associated with the two operational wind farms (Khobab Wind Farm and Loeriesfontein Wind Farm) further reinforce this effect and increase the visual absorption capacity within the foreground/middle ground areas surrounding the sub-station.There is a low coverage of land with the natural vegetation dominated by low shrubs and grasses (Section 6.1), resulting in a low natural visual absorption capacity.

6.8.1.1 Project zone of Visual Influence

The visible extent, or viewshed, is defined as "*the outer boundary defining a view catchment area, usually along crests and ridgelines*"[15]. In order to assess the proposed project visibility, a viewshed analysis was undertaken by the visual specialist. An indicative height of 240 m was used for the wind turbines which resulted in a probable zone of visual influence carrying 28 km. These viewsheds are only informative as visibility tends to diminish exponentially with distance.

Within the viewsheds, beyond the middle ground buffer, the visibility becomes fragmented due to the undulation of the terrain. Due to the flat nature of the terrain in relation to the height of the proposed landscape modification, the Viewshed is defined as Regional.

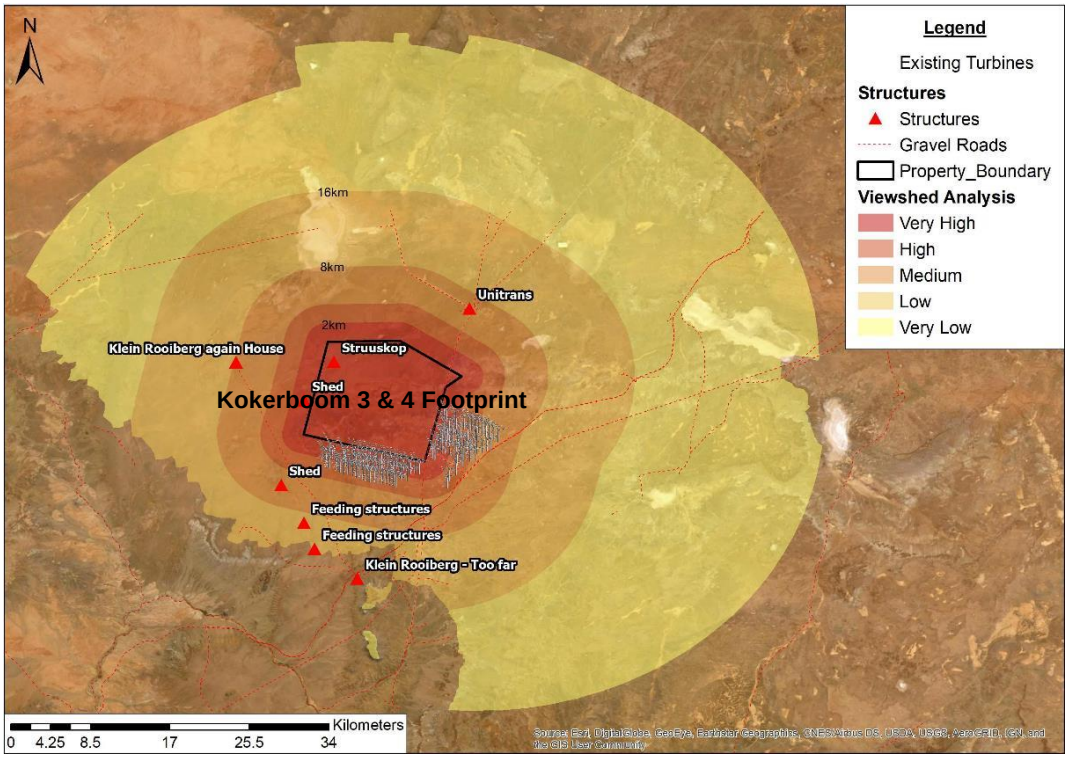


Figure 6-19:| Property assessment area approximate visibility and exposure map generated from a 240 m offset, and the KOP location point.

6.8.2 Impact assessment with mitigation measures

The visual impact of the proposed Kokerboom 3 Wind Farm and associated infrastructure will largely be caused by the sheer size of the wind turbines when they are operating.

[15] Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development

Other visual impacts may be associated with the construction phase such as littering and dust, and movement of construction equipment. However, these activities are described in detail above in Section 6.7 and will not be further addressed below. The impacts considered below therefore include:

- Visual intrusion from large and moving construction vehicles, and large cranes in the landscape during construction phase (-);
- Visual intrusion from large and moving wind turbines in the landscape during operation (-);
- Aircraft warning lights at night-time during operation phase (-);
- Landscape change from construction of BESS, O&M and Substation in operation phase (-).

Table 6-43 | Presence of large construction vehicles (including cranes)

Phase	Pre-Construction	**Construction**	Operational	**Decommissioning**
Impact description	Loss of landscape character from the construction phase of the wind farm that will include the movement of heavy vehicles, dust from moving vehicles, earth moving equipment, excavation of the platforms, construction of the turbines, earthworks and rehabilitation. This will include certain tall equipment such as large cranes used to assemble the wind turbine towers. As this will be a sporadic event, the duration is anticipated to be short term. The size of the equipment and vehicles as well as the nature of the construction works make the impact difficult to mitigate.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Moderate		Low	
Duration	Short Term		Short Term	
Significance	**Minor (-)/Low**		**Minor (-)/Low**	
Probability	Almost certain / Highly probable		Likely	
Confidence	High		High	
Reversibility	High		High	
Mitigation measures				
• 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. • 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. • 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. • 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). • Removal of all wind turbine infrastructure, structures, cabling. Impacted areas need to be rehabilitated and restored to natural veld grasses (Decommissioning phase).			

Table 6-44 | Visual intrusion from large and moving wind turbines in the landscape

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	Large turbines with rotating blades operating for a long-term time period. Windblown dust on gravel roads, and potential loss of soil from soil erosion. Loss of landscape character from this phase of the wind farm that will include the movement of heavy vehicles, dust from moving vehicles, earth moving equipment, earthworks and rehabilitation. This will include certain tall equipment such as large cranes used to disassemble the wind turbine towers. As this will be a sporadic event, the duration is anticipated to be short term. The size of the equipment and vehicles as well as the nature of the decommissioning works make the impact difficult to mitigate.			

	Pre-Mitigation	Post-Mitigation
Nature	Negative	Negative
Extent	Regional	Regional
Intensity	Moderate	Moderate
Duration	On-going	On-going
Significance	**Moderate (-)/Medium**	**Moderate (-)/Medium**
Probability	Almost certain / Highly probable	Likely
Confidence	High	High
Reversibility	Low	Low
Mitigation measures		
• Dust suppression measures to reduce dust generated by moving vehicle. • Routing maintenance for soil erosion and strict litter control.		

Table 6-45 | Aircraft warning lights at night-time

Phase	Pre-Construction	Construction	Operational	**Decommissioning**
Impact description	The continuous red flashing of the aircraft warning lights at night can be very intrusive to an area which as a rural sense of place and dark skies at night.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Municipal area		Municipal area	
Intensity	Very high		Moderate	
Duration	On-going		On-going	
Significance	**Moderate (-)/Medium**		**Minor (-)/Low**	
Probability	Almost certain / Highly probable		Likely	
Confidence	Certain		Certain	
Reversibility	High		High	
Mitigation measures				
• Only place aircraft warning lights on selected turbines located on the perimeter (as per CAA requirements) so as to identify the outside extent of the wind farm.				

Table 6-46 | Landscape change from construction of BESS, O&M and Substation in operation phase

Phase	Pre-Construction	Construction	**Operational**	Decommissioning
Impact description	Change of local and surrounds visual resources due to the construction and operation of the proposed (2.5m high) structures, and buildings.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Limited	
Intensity	Moderate		Low	
Duration	Long Term		Long Term	
Significance	**Minor (-) Low**		**Minor (-)/Low**	
Probability	Likely		Probable	
Confidence	High		High	
Reversibility	High		High	
Mitigation measures				

- To reduce colour contrast, if permitted by the Original Equipment Manufacturer, the container structure should preferably be painted a suitable colour (e.g. light brown) so as to blend with the surrounding arid region landscapes.
- Light spillage reduction management should be implemented (refer to Annexure D).

6.8.3 No-go alternative

If the no-go alternative is selected, the site on which the proposed Kokerboom 3 Wind Farm is located will remain mostly natural or neutral with the existing industrial infrastructure in the immediate vicinity. This cumulative impact is further described below in Chapter 7.

6.8.4 Environmental impact statement

Due to the Moderate Magnitude, Short-term Duration and Regional Extent, the Visual Significance for Construction and Decommissioning Phases are rated Minor pre- and post-mitigation. Due to Medium Magnitude, Regional Extent but Long-Term Duration, the Visual Significance for Operation Phases are rated Moderate-negative pre-mitigation but can be reduced to Minor-negative with lights at night mitigation. This would require placing aircraft warning lights on only strategic corner turbines, or utilisation radar technology (pending CAA recommendations). As the visual resources of the area would accommodate the proposed wind farm landscape modification without significantly degrading the greater visual resources, the visual recommendation is that the project is *authorised with or without mitigation* for the following reasons:

- The presence of the Eskom Helios Substation which is large and has a strong visual presence in the landscape. There are also existing power lines in the landscape which, in conjunction with the railway line infrastructure, increase the VAC levels as seen from the district road.
- There is an existing precedent for two wind farms in the landscape which, due to their favourable spatial positioning, do not create a walled massing effect as seen from the surrounding receptors. The existing turbines also increase the VAC levels, as the proposed wind farm will be viewed in the background with the existing Khobab and Loeriesfontein wind farms in the foreground (travelling northwards)
- The larger turbines require a large spacing which requires a well-spaced layout that accentuate the vastness of the Nama-Karoo landscape.
- The remoteness of the locality significantly reduces the number of receptors and there is no landscape based eco-tourism activities in the immediate area that would be impacted by the proposed wind farm.

Visual sensitive areas are identified in Figure 6-20 below.

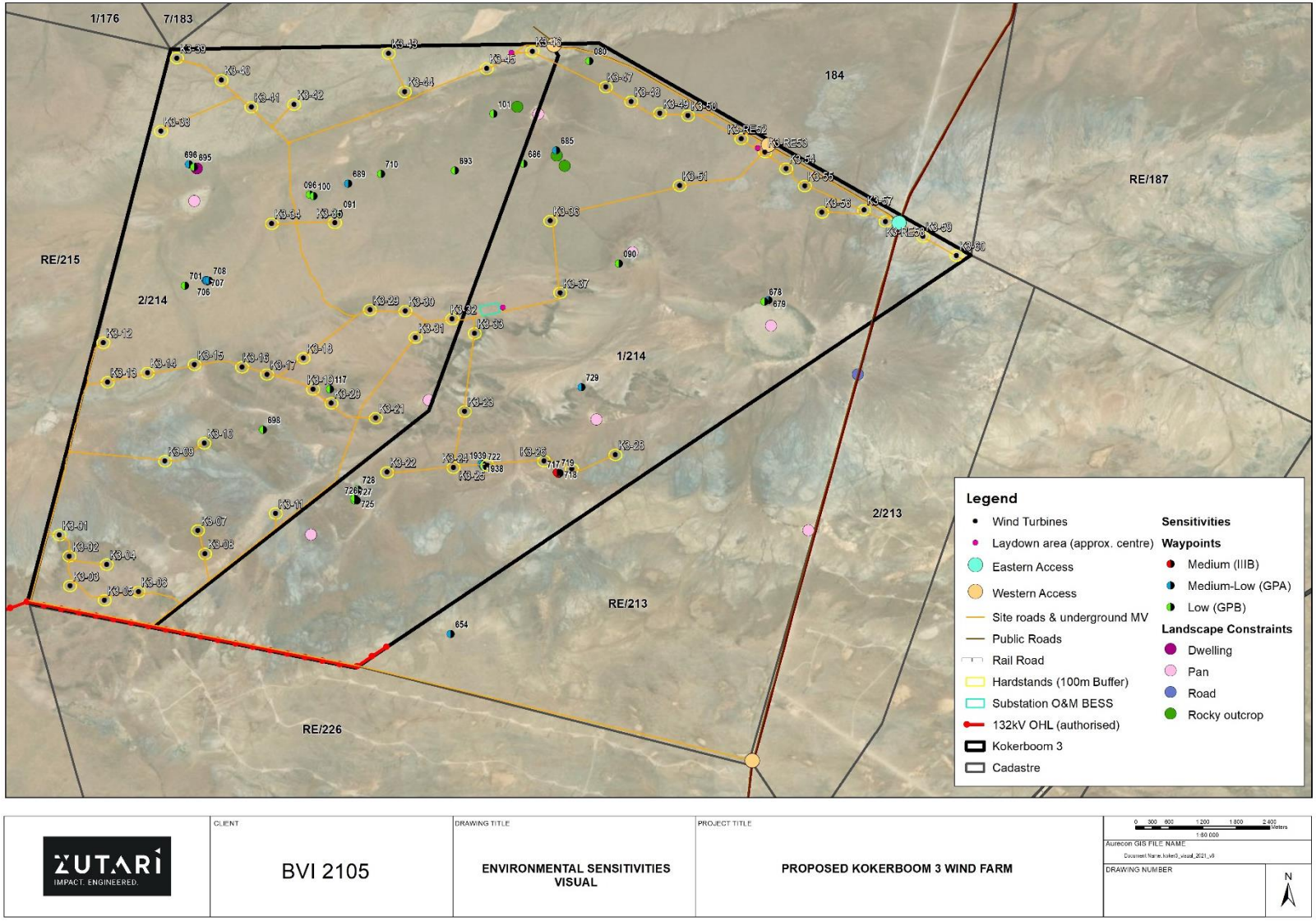


Figure 6-20 |Visual sensitivities within the footprint of the proposed Kokerboom 3 Wind Farm

6.9 Electromagnetic and Radio Frequency Interference

The Square Kilometre Array (SKA) is an international project aimed at enhancing the current space observation infrastructure, by installing thousands of radio telescopes in a unique configuration. Co-hosted between South Africa and Australia, the SKA telescope will have a collecting area of one million square metres (i.e. one square kilometre). Kokerboom 3 is located within the declared Karoo Central Astronomy Advantage Area. As such, the WEFs and associated infrastructure may pose a risk of detrimental impact on the SKA. Electromagnetic interference (EMI) and radio frequency interference (RFI) assessment was undertaken by Mr Callie Fouche of Interference Testing and Consulting Services (Pty) Ltd (ITC Services) and is available in Annexure D.

The desert regions in the Northern Cape Province of South Africa provide a suitable landscape for the telescope, with a quiet backdrop required for the high and medium frequency arrays of the SKA's telescope. In an effort to protect this unique landscape in the country, the Minister of Science and Technology declared three Astronomy Advantage Areas in the Karoo in terms of the Astronomy Geographic Advantage Act (Act 21 of 2007).

6.9.1 Risk of impact on infrastructure

The intent of the assessment was is to ensure that the Kokerboom 3 facility poses a low risk of detrimental impact on the SKA by comparing the anticipated emissions from equipment complying to the CISPR 11/32 class B limits minus the path loss due to distance and terrain to the protection levels required by SKA to ensure interference free operations. Because the specific turbine technology has not yet been selected, the assessment is based on a worst-case scenario which assumes that all 60 turbines are constructed, and that each turbines emit the maximum EMI permitted under the CISPR standards, and that emissions arise from the nacelle at 150m hub height.

As described in Section 5.1.2 and the specialist report (Annexure D), a wind turbine (and its connection to other wind turbines) consists of various components. The manner in which these components interact with one another, has the potential to cause interference, by emitting radio or electromagnetic waves at various frequencies. Components/ systems of an individual turbine that can be viewed as potential interference sources include:

- Control/ monitoring systems (including environmental sensors, and warning lights etc.);
- Power conversion equipment (such as rectifier or invertor systems); and
- Control and operations centre (which includes computer equipment).

The components of the control/ monitoring systems can either be located in the nacelle, or mounted by the base of the turbine, depending on manufacturer and turbine model. The level of emissions created from these systems are less if the components are located at the base of the turbine and are therefore preferred by SKA. It is also possible for specific shielding to be applied to lessen the risk of emissions caused by cables and the control and operations centre components.

6.9.2 Impact assessment with mitigation measures

The results of the EMI & RFI assessment are presented in full in Annexure D. The impacts considered include:

- Electromagnetic and radio frequency on SKA infrastructure (-)

Table 6-47 | Electromagnetic and radio frequency on SKA infrastructure

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Risk of detrimental impact on the SKA by comparing the anticipated emissions from equipment complying to the CISPR 11/32 class B limits minus the path loss due to distance and terrain to the protection levels required by SKA to ensure interference free operations.			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	N/A		N/A	
Duration	On-going		On-going	
Significance	**Minor (-)/Low**		**Minor (-)/Low**	
Probability	N/A		N/A	
Confidence	N/A		N/A	
Reversibility	Reversible		Reversible	
Mitigation measures				
• 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). • 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. • Compliance is achieved when the SARAS Protection level[16] is not exceeded at the SKA Infrastructure location. Certain conditions, such as a separation distance >50km for windfarms would exempt a development form applying for a permit under[16] unless it is found that radio frequency interference is caused.				

6.9.3 No-go alternative

If the no-go alternative is selected, the site on which the proposed Kokerboom 3 Wind Farm is located will remain as per the status-quo. This cumulative impact is further described below in Chapter 7.

6.9.4 Environmental impact statement

Due to the >90km separation distance between the Kokerboom development area and SKA infrastructure, an AMA Form 5 permit application will not be required for the development. Although an assessment based on generic data indicates possible interference with the SKA operations, an EMC Control Plan including Final mitigation requirements and corrective actions based on measurement results can only be developed once a technology partner is selected.

[16] No. R 90. Government Gazette 10 February 2012 (35007). Regulations on Radio Astronomy Protection Levels in Astronomy Advantage Areas Declared for the Purposes of Radio Astronomy

6.10 Transport

This section provides a short summary of the traffic impact assessment, the full specialist assessment compiled by Zutari and peer reviewed by Mr A Schwarz is available in Annexure D and Annexure E respectively.

6.10.1 Description of road infrastructure

The general freight for the wind farm will comprise building materials, blades, nacelles, towers, hubs, cables and transformers. The imported freight will either be transported from The Port of Ngqura in the Eastern Cape or Saldanha Bay in the Western Cape to the site in the Northern Cape.

- The freight route from The Port of Ngqura, for abnormal loads is via Cradock, Bristown and Carnarvon; it comprises mostly surfaced roads for the majority of the way (except for a small detour onto gravel roads). This route is predominantly on National or Provincial Roads, with suitable conditions for the transport of normal freight, or abnormal loads with permits. The freight route for normal heavy vehicles is a more direct route through Aberdeen and Beaufort West. No toll fees are required on this route; however, abnormal permits will be required for the transport of the transformers and turbine components, irrespective of the final route determined by the logistics contractor.
- The freight route from Saldanha for abnormal loads is via Moorreessburg and Kliprand on the N7. This route is predominantly on National or Provincial Roads and is mostly surfaced roads with a 140km section on gravel roads from Kliprand to Loeriesfontein.

Building materials will most likely be transported locally, from Calvinia, while certain elements will be transported from various manufacturing centres in South Africa – most likely Coega Industrial Development Zone (IDZ) for blades, Atlantis for tower sections and Johannesburg for transformers. The transport of elements from these manufacturing centres will be predominantly on National and Provincial roads, which presents no limitations for normal freight.

Due to the distance from Calvinia to site (approximately 150km), significant reductions in heavy vehicle trips could be achieved by sourcing road building materials and concrete aggregate from new quarries or borrow pits in proximity to the site, provided that it is feasible with respect to the target implementation programme. The possible siting of quarries and/or borrow pits will be confirmed prior to construction, once a geotechnical investigation has been conducted.

There is a limited risk of delays to the various deliveries required for the construction of the facility, due to potential routine maintenance works (such as repairs and reseals). The impact of such activities is dependent on the scheduling of deliveries and of roads contracts and may be mitigated by the use of the alternative routes proposed in this report.

The traffic through all phases of the project would result in approximately 50 total daily trips and less than 25 vehicle trips per day during the peak periods and would have almost no noticeable impact on the existing traffic service levels. The traffic volume and congestion will peak during the construction phase, but this will be temporary. During the operational phases between 5 and 10 full time staff are expected to access the WEF.

There are 4 access proposals for Kokerboom 3. WEF:

1. A Northern access point off the public road, that branches off Granaatsboskolk Road to the West.
2. A Western access off the same road
3. Because Farm 214 is bisected by Granaatsboskolk Road and there are turbines on the eastern portion, an Eastern access, off Granaatsboskolk Road is proposed to the East portion.
4. Lastly, a Southern access is also proposed off the Kokerboom 2 access road as it will provide better access to the turbines in the south of the WEF.

Access to the site is from a public road and is considered to be acceptable. In general, no obvious problems were identified associated with the transport of freight along the proposed routes to the site, nor for the accesses required for the construction and maintenance of the facility. It will, however, be necessary to confirm certain aspects such as clearances, bridge capacities, etc., by the logistics contractor as part of their preparation as this will be dependent on the actual vehicles' configuration used.

6.10.2 Impact assessment with mitigation measures

The primary impact of heavy vehicle and abnormal vehicle transportation is the increased rate of road degradation. This will be at its highest intensity during the construction phase of the project. It is expected that the roads in and around Loeriesfontein and the site are able to accommodate the increased loading, however the degradation will be sped up; consequently, affecting any plans for routine maintenance. Abnormal vehicles also present an increased risk to other road users and specific safety protocols must be followed. Warnings and safety instructions should be communicated to the general public in all towns.

During the operational phase of the project the low volume of regular traffic will not present any increase in road degradation or risk to the general public. In the occurrence of ad-hoc or planned maintenance and replacement of turbine components there would be a limited amount of abnormal vehicle trips; a negligible amount in terms of loading. However, the increased risk to public safety would still apply.

The results of the Transport Assessment are presented in Annexure D. The impacts considered include:

- Roads, maintenance, and safety

Table 6-48 | Roads, maintenance and safety during construction and decommissioning

Phase	Pre-Construction	**Construction**	**Operational**	**Decommissioning**
Impact description	Roads, maintenance, and safety			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Regional		Regional	
Intensity	Low		Very low	
Duration	Short-term		Short-term	
Significance	**Minor (-)/Low**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	Reversible		Reversible	
Mitigation measures				
• Abnormal Vehicle route identification and assessment including road infrastructure assessment and proposals (to be undertaken during detailed planning phase pre-construction) • A Pre and Post road condition assessment of the Granaatboskolk Road used to site • Road maintenance & monitoring plan for the construction phase, for public roads (like Granaatboskolk Road) as well as internal site roads • Clear information published to public regarding dates, times and routes of abnormal vehicle transportation through various towns • Clear information published to public regarding risks associated with driving near or behind abnormal roads • Site accesses to be sufficiently large to safely accommodate turning radius of abnormal vehicles • Adequate warning signage of construction and abnormal vehicles in advance of site access point				

Table 6-49 | Roads, maintenance and safety during operation

Phase	Pre-Construction	Construction	Operational	Decommissioning
Impact description	Roads, maintenance, and safety			
	Pre-Mitigation		**Post-Mitigation**	
Nature	Negative		Negative	
Extent	Local		Local	
Intensity	Low		Very low	
Duration	Short-term		Short-term	
Significance	**Negligible (-)/Very Low**		**Negligible (-)/Very Low**	
Probability	Probable		Probable	
Confidence	Sure		Sure	
Reversibility	Reversible		Reversible	
Mitigation measures				
• Site accesses to be sufficiently large to safely accommodate turning radius of abnormal vehicles • Adequate warning signage of construction and abnormal vehicles in advance of site access point				

6.10.3 No-go alternative

If the no-go alternative is selected, the site on which the proposed Kokerboom 3 Wind Farm is located will remain as per the status-quo. This cumulative impact is further described below in Chapter 7.

6.10.4 Environmental impact statement

In general, no obvious problems were identified associated with the transport of freight along the proposed routes to the site, nor for the accesses required for the construction and maintenance of the facility. It will, however, be necessary to confirm certain aspects such as clearances, bridge capacities, etc., by the logistics contractor as part of their preparation as this will be dependent on the actual vehicle configurations used.

There are no obvious issues with the construction of a WEF in the area, as there are several other wind farms in the area. The identified transportation routes and existing road infrastructure are therefore deemed adequate for this construction activity. Granaatsboskolk Road was previously upgraded as part of all the construction activity in the area. Based on the low number of trips expected when all the WEFs are fully operational, and the fact that it does not function as an inter-town route, the road does not require any further upgrades. However, post construction the road must be reinstated to its current, pre-construction condition. The mitigation measures implemented correctly result in low to very low overall impacts

Based on the assessment there is no traffic or transportation reason that the construction and operation of the proposed WEF cannot be authorised.

7 POTENTIAL IMPACTS ASSOCIATED WITH CUMULATIVE EFFECTS

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all individual impacts. Where EIAs are typically carried out on specific developments, cumulative impacts may result from broader biophysical, social and economic considerations and typically cannot be addressed at the project level.

The assessment of cumulative effects will therefore be considered for all renewable energy developments (wind and solar) within a 30km radius of the proposed Kokerboom 3 Wind Farm. Developments considered here include:

- Developments currently undergoing an EIA process;
- Developments which have received Environmental Authorisation; and
- Developments under construction.

The projects that have been assessed by the specialists are provided below in Table 7-1 and Figure 3-3.

Table 7-1 | Cumulative projects

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	• Portion 2 of the Farm Graskoppies No. 176; and • Portion 1 of the Farm Hartebeest Leegte No. 216.
Hartebeest Leegte Wind Farm	EA issued	Mainstream	Wind	235MW	• Entire part of the Remainder of the Farm Hartebeest Leegte No. 216.
Xha! Boom Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Entire part of Portion 2 of the Farm Georg's Vley No. 217.
Ithemba Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Western portion of Portion 2 of the Farm Graskoppies No. 176; and • Western portion of Portion 1 of the Farm Hartebeest Leegte No. 216.
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Kokerboom 1 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Leeuwbergrivier No. 1163; and • Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Springbokpan No. 1164; and • Remainder of the Farm Springbok Tand No. 215.
Kokerboom 4 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1733 (Pty) Ltd (BVI)	Wind	60MW	• Remainder of the Farm Aan De Karree Doorn Pan No. 213

7.1 Agriculture

In quantifying the cumulative impact, the area of land taken out of grazing as a result of the thirteen other developments plus this one (total generation capacity of 3,015 MW) will amount to a total of approximately 2,434 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30km radius (approximately 282,700 ha), this amounts to 0.86% of the surface area. That is well within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. This is particularly so when considered within the context of the following point: In order for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are far higher in this region than in regions with higher agricultural potential.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore likely to be low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area. The proposed development is therefore acceptable in terms of cumulative impact, and it is therefore recommended that it is approved (Refer to Annexure D for the specialist statement).

7.2 Terrestrial Ecology (excluding birds and bats)

The cumulative assessment considers the wind farm and other wind farms located within 30 km of the project site, which includes operational and approved wind farms. The Ecologist has assessed 10 of the 14 projects within the above radius and is also currently reassessing several of these again as part of the REIPPP Round 5 tender process. All these project layouts have been developed with the premise that all pans and depressions will be avoided, while alluvial systems and watercourses, where not spanned will have small or limited numbers of crossings within minor (Low -) sensitivity areas.

The projects are spread over larger areas; thus the potential cumulative impact of the projects together is likely to be Minor (-) without the proposed mitigations measures. With all cumulative mitigations (dealt

with under foregoing impacts) together with the additional mitigations' measures proposed here, the impacts can be reduced to negligible. (Refer to Annexure D for the specialist statement).

7.3 Bats

For non-migratory species cumulative direct impacts could have a high significance before mitigation but could reduce to medium with appropriate turbine siting as per the bat sensitivity map and operational mitigation measures outlined in section 7 of the specialist report (Refer Annexure D). Direct impacts on the migratory species, *Miniopterus natalensis*, may be high before mitigation but could also reduce to medium with appropriate turbine siting and operational mitigation. However, these ratings would be dependent on all other surrounding wind energy facilities also adopting similar mitigation strategies to reduce impacts to bats. It is essential that project specific mitigations be applied and adhered to for each project, as there is no overarching mitigation that can be recommended on a regional level due to habitat and ecological differences between project sites.

7.4 Avifauna (birds)

The avifaunal specialist highlighted in his report (Annexure D) that the maximum number of authorised, planned and constructed turbines per wind farm within a 30km radius around the proposed Kokerboom 3 WEF are 503 turbines. Of these, a total of 122 have been constructed. However, each of the planned projects must still be subject to a competitive bidding process where only the most competitive projects will win a power purchase agreement required for the project to proceed to construction. It is therefore unlikely that a total of 503 turbines will actually be constructed, but due to the possibility that it could happen, one needs to apply the precautionary principle and assume that it will be the case. The Kokerboom 3 WEF will consist of 60 turbines, which constitute just over 11% of the total planned number of turbines. As such, its cumulative contribution to the total number of turbines, and by implication the impacts associated with the turbines, is low.

The total surface area of all the land parcels where the planned and constructed renewable energy developments (wind and solar) within a 30km radius are located amounts to approximately 938km². The total land surface area taken up by a 30km radius around the Kokerboom 3 WEF amounts to about 4 273km². The Kokerboom 3 WEF itself make up about 2.3% of the area within the 30km radius, which means the cumulative impact of the WEF itself is low. However, the land parcel area for the combined planned renewable energy projects constitutes approximately 22% of the area within the 30km radius, which is a medium to high impact as far as potential habitat transformation is concerned. Chris van Rooyen Consulting were the avifaunal specialists on all the wind farm developments within the 30km radius, therefore they are well acquainted with these developments. Should the recommendations in the specialist studies for these wind developments be strictly implemented, the cumulative impact of these wind farms should be medium.

7.5 Aquatic Ecology

The aquatic specialist is confident that the cumulative impact of the proposed Kokerboom 3 Wind Farm added to the other proposed projects would be of medium negative significance without mitigation, and low negative significance with mitigation measures. The cumulative assessment considers the wind farm and other wind farms located within 30 km of the project site, which includes operational and approved wind farms. The aquatic specialits has assessed 10 of the 14 projects within the above radius and is also currently reassessing several of these again as part of the REIPPP Round 5 tender process. All these project layouts have been developed with the premise that all pans and depressions will be avoided, while alluvial systems and watercourses, where not spanned will have small or limited numbers of crossings within minor (Low -) sensitivity areas.

The projects are spread over larger areas thus, the potential cumulative impact of the projects together is likely to be Minor (-) without the proposed mitigations measures. With all cumulative mitigations (dealt

with under foregoing impacts) together with the additional mitigations' measures proposed here, the impacts can be reduced to negligible. (Refer to Annexure D for the specialist statement).

7.6 Heritage (including Archaeology)

7.6.1 Heritage

It is impossible to quantify the impacts to heritage resources because comprehensive surveys of all cumulative projects are impossible and the reliability of the various reported surveys is likely to be variable. Furthermore, cultural significance assessment is variable between practitioners. Although some archaeological sites are likely to be (or have been) lost during the construction of other facilities (two wind energy facilities already occur, while other renewable energy facilities have been authorised nearby), it is clear that culturally significant heritage resources are rare on the local landscape (see desktop review above). Also, the individual significance of each site is such that it does not extend beyond the local area. The Kokerboom 3 wind farm layout avoids all known significant heritage sites with and mitigation is easy to implement. The project will thus make a fairly small contribution to cumulative impacts which are deemed to be of low (minor -) significance in this case.

Although the construction of other facilities will also affect the cultural landscape (two wind energy facilities already exist, and other renewable energy facilities have been authorised nearby), it is deemed preferable to cluster the renewable energy developments such that the impacts are kept to one area. Further away the cultural and natural landscape would no longer be affected. Cumulative impacts are deemed to be of low significance in this case because the landscape is not highly sensitive and is rather more natural than cultural. (Refer to Annexure D for the specialist statement).

7.6.2 Palaeontology

Given the low (minor -) palaeontological sensitivity of the combined Kokerboom 3 and Kokerboom 4 Wind Farm project area, and the low (minor -) impact significance determined for these two WEFs and other renewable energy projects in the broader Bushmanland region north of Loeriesfontein (cf. Almond 2011a, 2011b, 2014c, 2017a, Pether 2012, Groenewald 2014, Millsteed 2014, Butler 2016) it is concluded that the cumulative impact of all the two WEF developments is low (minor -). (Refer to Annexure D for the specialist statement).

7.7 Socio-economic Context

The cumulative effects of the renewable energy developments within the 30km radius are likely to have both negative and positive impacts on the socio-economic environment.

During the construction and to a lesser degree, the operational phase, of each project, the local services (medical, education and accommodation, etc.) in the surrounding towns are likely to have pressure placed on them. This will largely be due to the influx of non-local workers to the area. This will also likely place pressure on property prices and rentals and as a result, local residents may no longer afford to rent or buy accommodation in the surrounding towns. However, by recommending to each of the projects that they employ local labour first, this could effectively mitigate the cumulative impact to low negative significance.

The establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of cumulative socio-economic opportunities for the HLM and NDM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. associated BESS indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The

establishment of a Community Trust will also benefit socio-economic development in the area. The establishment of the 300 MW Kokerboom 3 WEF and associated BESS is therefore supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report and other key specialist studies. (Refer to Annexure D for the specialist statement).

7.8 Nuisance Impacts (Noise)

The cumulative effects of nuisance impacts are difficult to anticipate given that it is uncertain when many of these projects will be implemented (if they are all successful in both environmental authorisation and selected as preferred bidders in the REIPPPP).

Considering the low (minor -) significance of the potential noise impacts (with mitigation, inclusive of cumulative impacts) for the proposed WEF and associated infrastructure, there is no reason that the proposed Kokerboom 3 WEF should not be authorized, from a noise perspective. (Refer to Annexure D for the specialist statement).

7.9 Transport

The cumulative traffic impact will only have a noticeable if the construction timelines as well as type of components, manufacturing centre, importation ports, transportation routes and methods, etc. are aligned – which is unlikely to occur.

- Neighbouring WEFs, Loeriesfontein and Khobab wind farms are currently operational and are likely generating a total 10 additional peak hour trips to the background traffic
- It is known that the WEFs Kokerboom 1, Kokerboom 2 have been authorized and will be bid into the competitive REIPPPP process. These two WEFs will similarly be contributing another 10 peak hour trips to the background traffic by the time Kokerboom 3 begins construction
- Kokerboom 4 is proposed on the neighbouring Aan de Karree Doorn Pan (RE/213) – assuming its construction timeline aligns with Kokerboom 3 it will generate approximately 15 to 20 trips as it is a smaller WEF
- !Xha Boom, Ithemba, Hartbeesleegte,Dwarsrug Wind Farm and Graskoppies Wind Farm are proposed in the vicinity. Once again, assuming their construction timeline aligns with Kokerboom 3, it will generate a combined 100 trips. However, their transport routes also propose an alternative route that uses the R358 and approached the construction site from the west – this makes it all the more difficult to accurately quantify the trips on the surrounding road network.

Should all construction occur at the same time there will be an increase of approximately 100 peak hour trips, the majority of which will be transient.

Construction of the neighbouring WEFs is likely to not conflict with the construction schedule of the Kokerboom 3 project. In the worst-case “construction” scenario there would then be a significant impact on traffic and congestion in the area. However, increased traffic during a construction phase is expected and accepted because it is temporary.

In the worst-case “operational” scenario i.e. during the operational phase of all neighbouring facilities, the total increase in traffic would be between 40 and 60 trips and will still be considered as negligible. The addition of Kokerboom’s 10 trips would not warrant detailed assessment beyond the scope of this desktop assessment. (Refer to Annexure D for the specialist statement).

7.10 Visual Landscape

The potential for negative Cumulative Effects to result from the construction and operation of the project are likely to be Medium. The wind potential of the area, and the large Eskom Substation, are likely to increase the potential for the area to be established as a renewable energy node which could result in massing effects. The potential is moderated by the remoteness of the locality, where existing dry-land sheep farming can continue to take place amongst the turbines, and also due to there being no landscape based eco-tourism in the vicinity. As the sense of place is already associated with turbines, the main visual impact is likely to be the massing effect from multiple aircraft warning lights at night. Mitigation is possible (pending authorisation from the CAA regarding the utilisation of reduced aircraft warning lights), and should this mitigation be implemented, the negative cumulative effects from multiple lights at night can be reduced. (Refer to Annexure D for the specialist statement).

7.11 Electromagnetic and Radio Frequency Interference

A standard factor of 10 log10 N where N = the number of turbines (17.8dB for the Kokerboom 3 site) to account for cumulative emissions has been applied. When the data becomes available, the total cumulative effect including windfarms in a 30km radius from Kokerboom 3 should be calculated. (Refer to Annexure D for the specialist statement).

Given that the emissions from the Kokerboom Wind Farm will be attenuated in accordance with the EMC Control Plan, such that the Wind Farm will not result in interference at the SKA, then the Kokerboom 3 Wind Farm is expected to have no contribution to the potential cumulative impact to the SKA.

7.12 Overall Cumulative Impact Environmental Statement

Whilst the area around the Helios Substation near Loeriesfontein has a number of other renewable energy projects in progress (either constructed, under construction, or granted environmental authorisation), it is the opinion of the EAP that the cumulative impacts have been appropriately assessed and found to be acceptable with mitigation. Furthermore, it is noted that the significant positive cumulative benefits that have been identified outweigh the negative cumulative impacts. Such positive cumulative impacts include grouping the visual degradation of the landscape to a confined area; the continued socio-economic benefits provided to the small towns that otherwise have limited means of income and employment; and using land without a high agricultural potential, etc. The project is therefore supported by the EAP on both the consideration of the site-specific impacts, as well as the cumulative impacts caused by the other renewable projects falling within a radius of 30km of the proposed Kokerboom 3 Wind Farm.

8 CONCLUSIONS AND WAY FORWARD

8.1 Conclusions

As per the requirements of NEMA, this EIR document addresses the assessment of the environmental impacts and respective mitigation or enhancement measures and recommendations for the Kokerboom 3 Wind Farm. Table 8-1 below provides a summary of the description of the proposed project and the significance ratings are summarised in Table 8-2.

Table 8-1 | Summary of proposed project description

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	• Up to a maximum of 60 wind turbines. • Turbine envelope: o Rotor diameter: up to 180 m (90 m blade) o Hub height: up to 150 m o Rotor top tip height: up to 240 m o Steel or concrete towers • Kokerboom 3 has a targeted nameplate capacity of up to a maximum of 300 MW.	-
Turbine Foundations and Hardstands	At each turbine position there will be • A hardstand area of up to 150 m x 100 m • A laydown/assembly area of ~150 m x 15 m 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).	3,2ha foundations (permanent) 3ha foundations construction footprint (temporary, in addition to permanent footprint) 90ha hardstand (permanent) 13,5ha laydown (temporary)
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	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. 8m 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.	±76ha (8m width) (permanent) 114ha (12m width) (temporary)
Facility Substation and O&M Complex	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: • Facility substation (approx. 1ha)	5ha (permanent)

	• O&M building (approx. 0.5 ha) • Oil storage area (less than 30m^3) (approx. 0.1 ha) • Battery Energy Storage Facility (approx. 2 ha) • Associated facilities including the parking area	
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. 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.	up to 45ha (temporary)
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

During the EIR phase some of the specialists revisited the site in order to undertake detailed walkthroughs and inform the micro-siting and finalisation of the layout and EMPr. These included the Avifauna, Ecology (Terrestrial and Aquatic) and Heritage specialists who visited the site in June 2021. The remaining specialists provided comments on the final micro-sited layout and additional mitigations where appropriate to inform the finalisation of the EMPr. The layout presented and assessed in this report that the applicant is seeking an Environmental Authorisation for is thus the final micro-sited layout and the EMPr attached is the final EMPr that is aligned with the micro-sited layout. The final layout and EMPr are put forward for approval together with the issuing of the EA (if granted).

The potential impacts associated with the proposed Kokerboom 3 Wind Farm and associated infrastructure are summarised below in Table 8-2. Should the mitigation provided in the tables in Chapter 6, and detailed in the EMPr (Annexure F) be implemented, post-migration impacts are anticipated to range between negligible to moderate negative significance, and up to major positive.

Table 8-2 | Summary of impact assessment

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 (-)**
	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**

Aspect	Impact	Pre-mitigation	Post-mitigation
	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**
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 (-)** / **Minor (+)/**

Aspect	Impact	Pre-mitigation	Post-mitigation
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 (+)**
	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 (-)**

8.2 Recommendations and Opinion of the EAP

After consideration of all identified impacts, the EAP is of the opinion that the proposed development is acceptable, and no fatal flaws have been identified with the development or the proposed alternatives.

The mitigation measures proposed by the EAP and relevant specialists (Chapters 6 and 7; Annexures D and F) are recommended to manage the identified impacts associated with the proposed Kokerboom 3 Wind Farm and associated infrastructure. We request that the following conditions be considered by the decision makers for inclusion in the environmental authorisation, should one be granted.

Condition 1: The holder of the EA shall appoint an environmental control officer (ECO) for the construction phase of the development to monitor the implementation of the specified mitigation measures. The operator should appoint an environmental officer or other suitably qualified individual during the operational phase, to oversee and monitor the implementation of the specified management and mitigation measures. The holder of the EA remains ultimately responsible for ensuring the mitigation/rehabilitation measures are implemented.

Condition 2: The holder of the EA shall appoint an avifaunal specialist and bat specialist to undertake post-construction monitoring to determine the effectiveness of the pre-construction monitoring, in accordance with the relevant guidelines in effect at the time. The holder of the EA shall undertake to implement any additional reasonable mitigation measures deemed necessary by the specialist during or at the end of the monitoring period. The findings of the monitoring and any additional mitigation measures recommended by the specialist shall be reported to the DFFE.

Condition 3: Any works that fall within 32m of a drainage line, and 500m of a wetland will require the relevant authorisations from the DWS, prior to construction.

Condition 4: The archaeological site at waypoints 722, 1938 and 1939 must be subjected to mitigation (in the form of sampling and collection) prior to construction of turbine #25 and the adjacent road. The site at waypoints 717 to 719 must be demarcated as a no-go area and monitored by the ECO to ensure that it is not damaged during construction; and

Condition 5: 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.

With the recommended mitigation measures implemented, the positive local and regional benefits of the Kokerboom 3 Wind Farm and associated infrastructure outweigh the negative impacts and the proposed project has a sound motivation demonstrating the Need and Desirability (Section 5.2). Based on the outcome of this EIA process, Zutari as the EAP, are of the opinion that the project is preferred over the no-go alternative and recommend that environmental authorisation be granted for the proposed Kokerboom 3 development.

Whilst the area around the Helios Substation near Loeriesfontein has a number of other renewable energy projects in progress (either under construction, or granted environmental authorisation), it is the opinion of the EAP that the cumulative impacts have been appropriately assessed. Furthermore, given the nature of the positive benefits of the cumulative impacts outweigh the negatives. Such positive cumulative impacts include: grouping a visually degraded landscape to a confined area; the continued socio-economic benefits provided to the small towns that otherwise have limited means of income and employment; and using land without a high agricultural potential, etc. The project is therefore supported by the EAP on both the consideration of the site specific impacts, as well as the cumulative impacts caused by the other renewable projects falling within a radius of 30km of the proposed Kokerboom 3 Wind Farm.

8.3 Level of Confidence in Assessment

Assessment of potential environmental impacts requires prediction of the impacts of a defined activity against the collected baseline data, through the application of professional judgement. It therefore depends on the level of information available describing the activity; the quality of the baseline data collected; and the skills and expertise of the specialists involved. The EIA project team has been listed in Table 1-3 and CVs of the EAP are included in Annexure A, with declarations of the specialists included in Annexure D as per the DFFE protocol.

It is acknowledged that some project details may evolve during the detailed design and construction phases. However, these are unlikely to change the overall environmental impact of the proposed project. Furthermore, any significant deviation from that assessed in this EIA should be subject to further assessment and may require an amendment to the authorisation granted by DFFE, after due process has been met.

On this basis, the confidence in the environmental assessment undertaken is regarded as being acceptable for decision-making, specifically in terms of the environmental impacts and risks. The EAP believes that the information contained within the EIR is adequate to inform DFFE to determine the environmental acceptability of the proposed alternatives.

8.4 Way Forward

Following 30-days of public consultation on the draft EIR, all comments received will be collated, responded to and attached to the EIR. The EIR will be updated and finalised as required to address the comments received. The Final EIR will be submitted to the DFFE for decision-making. Simultaneously, a copy of the final EIR will be made available to all registered I&APs for their reference and review. Following submission of the Final EIR, the DFFE must within 10 days, acknowledge receipt of the Final EIR. After acknowledging receipt, the DEA must, within 107 days of receipt of the Final EIR and EMPr, do one of the following:

- Grant environmental authorisation in respect of all or part of the activity applied for; or
- Refuse environmental authorisation.

Once the DFFE has reached a decision on the application they must, in writing and within five days:

- Provide the applicant with the decision;
- Give reasons for the decision to the applicant; and
- Where applicable, draw the attention of the applicant to the fact that an appeal may be lodged against the decision in terms of the Appeals Regulations, if such appeal is available in the circumstances of the decision.

After receipt of the decision from the DFFE, all registered I&APs on the project database will be notified of the outcome of the decision within 14 calendar days of the date of the decision and be provided with access to the decision and reasons for such decision. I&APs will also be informed of the Appeal procedure.

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In diversity there is beauty and there is strength.

MAYA ANGELOU

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