ESIZAYO WIND (RF) (PTY) LTD

PROPOSED ESIZAYO WIND ENERGY FACILITY EXPANSION AND ASSOCIATED INFRASTRUCTURE NEAR LAINGSBURG, WESTERN CAPE

DRAFT BASIC ASSESSMENT REPORT

06 MAY 2022

DRAFT

PROPOSED ESIZAYO WIND ENERGY FACILITY EXPANSION AND ASSOCIATED INFRASTRUCTURE NEAR LAINGSBURG, WESTERN CAPE

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ESIZAYO WIND (RF) (PTY) LTD

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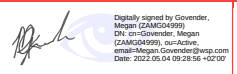
Signature	 Digitally signed by Govender, Megan (ZAMG04999) DN: cn=Govender, Megan (ZAMG04999), ou=Active, email=Megan.Govender@wsp.com Date: 2022.05.04 09:28:56 +02'00'			
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Ashlea Strong
Associate (Environmental Assessment Practitioner)

This Draft Basic Assessment Report (Report) for the proposed Esizayo WEF Expansion Project has been prepared by WSP Group Africa Proprietary Limited (WSP) on behalf and at the request of Esizayo Wind (RF) (Pty) Ltd (Client), as part of the application process for Environmental Authorisation.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

DOCUMENT DESCRIPTION

CLIENT

Esizayo Wind (RF) (Pty) Ltd

PROJECT NAME

Esizayo WEF Expansion and Associated Infrastructure, Western Cape, South Africa

PRE-APPLICATION REFERENCE NUMBER

2022-03-0020

DFFE REFERENCE NUMBER

Not yet issued

REPORT TYPE

Draft Basic Assessment Report

WSP PROJECT NUMBER

41103063

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Senior Consultant	Megan Govender
Consultant	Lukanyo Kewana

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Terrestrial Ecology and Bat Specialist	The Biodiversity Company: Andrew Husted
Heritage Specialist	ACO Associates: John Gribble
Palaeontology Specialist	Natura Viva cc: Dr John Edward Almond
Socio-Economic Specialist	Tony Barbour Environmental Consulting: Tony Barbour
Soil Specialist	WSP Group: Karen King
Hydrologist	WSP Group: Zakariya Nakhooda
Noise Specialist	WSP Group: Kirsten Collett
Visual Specialist	LOGIS: Lourens Du Plessis
Traffic Specialist	WSP Group Africa: Christo Bredenhann

ACRONYMS

AEL	Atmospheric Emission Licence
AIS	Alien and Invasive Species
BA	Basic Assessment
BAR	Basic Assessment Report
BBBEE	Broad Based Black Economic Empowerment
BPEO	Best Practicable Environmental Option
BSP	Biodiversity Spatial Plan
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CH	Critical Habitat
CIA	Cumulative Impact Assessment
CR	Critically Endangered
CRR	Comments and Responses Report
CSP	Concentrated solar power
CV	Curriculum vitae
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
DoA	Department of Agriculture
DoT	Department of Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EDL	Episodic drainage line
EGI	Electricity Grid Infrastructure
EHS	Environmental, Health and Safety

EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
EPL	Ecosystem Protection Level
EPFI	Equator Principles Financial Institution
ERA	Electricity Regulation Act (Act 4 of 2006)
ESA	Ecological Support Area
ESA	Early Stone Age
ESMS	Environmental and Social Management System
ETS	Ecosystem Threat Status
EWT	Endangered Wildlife Trust
FI	Financial Institution
FPIC	Free, Prior, and Informed Consent
GA	General Authorisation
GBIF	Global Biodiversity Information Facility
GM	Grievance Mechanism
GG	Government Gazette
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GN	Government Notice
GNR	Government Notice Regulation
GPS	Global Positioning System
IBA	Important Bird Area
ICAO	International Civil Aviation Organisation
ICP	Informed Consultation and Participation
IDP	Integrated Development Plan
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPPPP	Independent Power Producer Procurement Programme

IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
LC	Least Concern
LSA	Later Stone Age
MF	Monitoring Forum
MP	Moderately Protected
MSA	Middle Stone Age
MSDS	Material Safety Data Sheets
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environment Management Air Quality Act (No. 39 of 2004)
NEMBA	National Environmental Management Biodiversity Act (Act 10 of 2004)
NEMPAA	National Environmental Management Protected Areas Act (Act 57 of 2003)
NEMWA	National Environmental Management Waste Act (Act 59 of 2008)
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resource Act (Act 25 of 1999)
NID	Notice of Intent to Develop
NIP	National Infrastructure Plan
NP	Not Protected
NT	Near Threatened
NWA	National Water Act (Act 36 of 1998)
OEC	Obstacle Evaluation Committee
OHPL	Overhead Powerline
OHSA	Occupational Health and Safety Act (Act 85 of 1993)
ONA	Other Natural Areas
PA	Protected Area
PES	Present Ecological State
PICC	Presidential Infrastructure Coordinating Commission
POSA	Plants of South Africa
PP	Poorly Protected

PPE	Personal Protective Equipment
PPP	Public Participation Process
PS	Performance Standard
PSDF	Provincial Spatial Development Framework
PVSEF	Photovoltaic Solar Energy Facility
REDZ	Renewable Energy Development Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SAAF	South African Air Force
SA CATS	South African Civil Aviation Technical Standards
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Areas Database
SARPs	Standards and Recommended Practices
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SER	Stakeholder Engagement Report
SIA	Social Impact Assessment
SIP	Strategic Integrated Projects
SKEP	Succulent Karoo Ecosystem Programme
SO	Spatial objective
SPLUMA	Spatial Planning and Land Use Management Act (Act 16 of 2013)
STD	sexually transmitted disease
UN	United Nations
VEC	Valued Environmental and Social Components
VU	Vulnerable
WBG	World Bank Group
WMA	Water Management Area
WML	Waste Management Licence

WP	Well Protected
WSP	WSP Group Africa (Pty) Ltd
WUL	Water Use Licence

CONTENTS OF THIS REPORT

As per the Environmental Impact Assessment (EIA) Regulations 2014, as amended, Appendix 1 of Government Notice Regulation (GNR) 982 (as amended) identifies the legislated requirements that must be contained within a Basic Assessment Report (BAR) for the Competent Authority (CA) to consider and come to a decision on the application. **Table A** below details where the required information is located within the draft BAR (this report).

Table A: Legal Requirements as detailed in Appendix 1 of GNR 982 of the 2014 EIA Regulations, as amended

APPENDIX 1 OF GNR 982 (AS AMENDED)	DESCRIPTION	RELEVANT REPORT SECTION
3(1) (a)	Details of the EAP who prepared the report and the expertise of the EAP, including a curriculum vitae	**Section 1.3** **Appendix A**
3(1) (b)	The location of the activity	**Section 4.1**
3(1) (c)	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale	**Section 4.1 and 4.2**
3(1) (d)	A description of the scope of the proposed activity	**Section 4.2 and 4.3**
3(1) (e)	A description of the policy and legislative context within which the development is proposed	**Section 2**
3(1) (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 location	**Section 4.4**
3(1) (g)	A motivation for the preferred site, activity and technology alternative	**Section 5** **Section 9.4**
3(1) (h)	A full description of the process followed to reach the proposed alternative within the site	**Section 5** **Section 9.4**
3(1) (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity	**Section 3.5**
3(1) (j)	An assessment of each identified potentially significant impact and risk	**Section 7**
3(1) (k)	Where applicable, a summary of the findings and impact management measures identified in 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 report	**Section 3.4 and 3.5** **Section 6** **Section 7** **Section 8** **Section 9.1 and 9.2**
3(1) (l)	An environmental impact statement	**Section 9**
3(1) (m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the Environmental Management Programme (EMPr).	**Section 7** **Appendix G**

APPENDIX 1 OF GNR 982 (AS AMENDED)	DESCRIPTION	RELEVANT REPORT SECTION
3(1) (n)	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 9**
3(1) (o)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	**Section 3.7**
3(1) (p)	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 9**
3(1) (q)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be conducted, and the post construction monitoring requirements finalised	**N/A**
3(1) (r)	An undertaking under oath or affirmation by the EAP	**Appendix B**
3(1) (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	**N/A**
3(1) (t)	Any specific information that may be required by the competent authority	**N/A**
3(1) (u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act	**N/A**

GENERAL SITE INFORMATION

TECHNICAL DETAILS OF THE PROPOSED ESIZAYO WIND ENERGY EXPANSION PROJECT

Location of the Site	Approximately 30 km northeast of Laingsburg
Total Area of the Site	5 954 ha
Size Of Buildable Area i.e. Project Infrastructure Footprint (Only Referred Layout, Inclusive of All Associated Infrastructure)	Up to 200 ha (including turbines, roads and powerlines)
Area Occupied By Each Turbine	Each turbine with a foundation of up to 25 m in diameter and up to 4 m in depth, compacted hard standing areas of up to 4.5 ha each
Farm Names	Portion 2 of Farm Aanstoot Farm 72 (C04300000000007200002) Portion 1 of Farm Leeuwenfontein 71 (C04300000000007100001) Remainder of Farm Leeuwenfontein 71 (C04300000000007100000)
Export Capacity	Up to 200 MW
Proposed Technology	Wind turbines
Number Of Turbines	Up to 23 wind turbines
Turbine Generating Capacity	Up to 10 MW
Hub Height From Ground Level	Up to 150 m
Rotor Diameter	Up to 200 m
Width Of Internal Roads	Up to 9 m (vertical curves will have a radii up to 55m)
Length Of Internal Roads	30 km
Area Of Preferred Operations and Maintenance Building	The expansion project will use the authorised Esizayo project's O&M building
Footprint Of Operations and Maintenance Building(S)	The expansion project will use the authorised Esizayo project's O&M building
Area Of Preferred Construction Laydown Areas	The expansion project will use the authorised Esizayo project's construction laydown area
Cement Batching Plant	The expansion project will use the authorised Esizayo project's cement batching plant

Power Lines	33 kV underground cables or overhead powerlines linking groups of wind turbines to an onsite 132 kV substation. The 132kV substation and grid connection is included in a separate application and not included in the expansion project scope of work.

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FIGURES

APPENDICES

1 INTRODUCTION

1.1 BACKGROUND AND TERMS OF REFERENCE

On 14 July 2017, BioTherm Energy (Pty) Ltd (BioTherm) (Trading as BTE Renewables) received an EA (DFFE Ref no: 14/12/16/3/3/2/967) for the proposed Esizayo Wind Energy Facility (WEF) to be constructed on Portion 1 of Aanstoot Farm No 72, Annex Joseph's Kraal Farm No 84 and Aurora Farm No 285.

The EA holder was amended in September 2021 to Esizayo Wind (RF) (Pty) Ltd (Esizayo) (DFFE Ref: 14/12/16/3/3/2/967/AM1). Therefore, the applicant for this project will also be Esizayo.

Esizayo now proposes to expand the existing authorised Esizayo WEF extent by adding three new land parcels. The Esizayo WEF Expansion Project is proposed to be constructed on Portion 1 of Farm Leeuwenfontein, 71, Remainder of the Farm Leeuwenfontein, 71 and Portion 2 of Farm Aanstoot, 72 (**Figure 1-1)**.

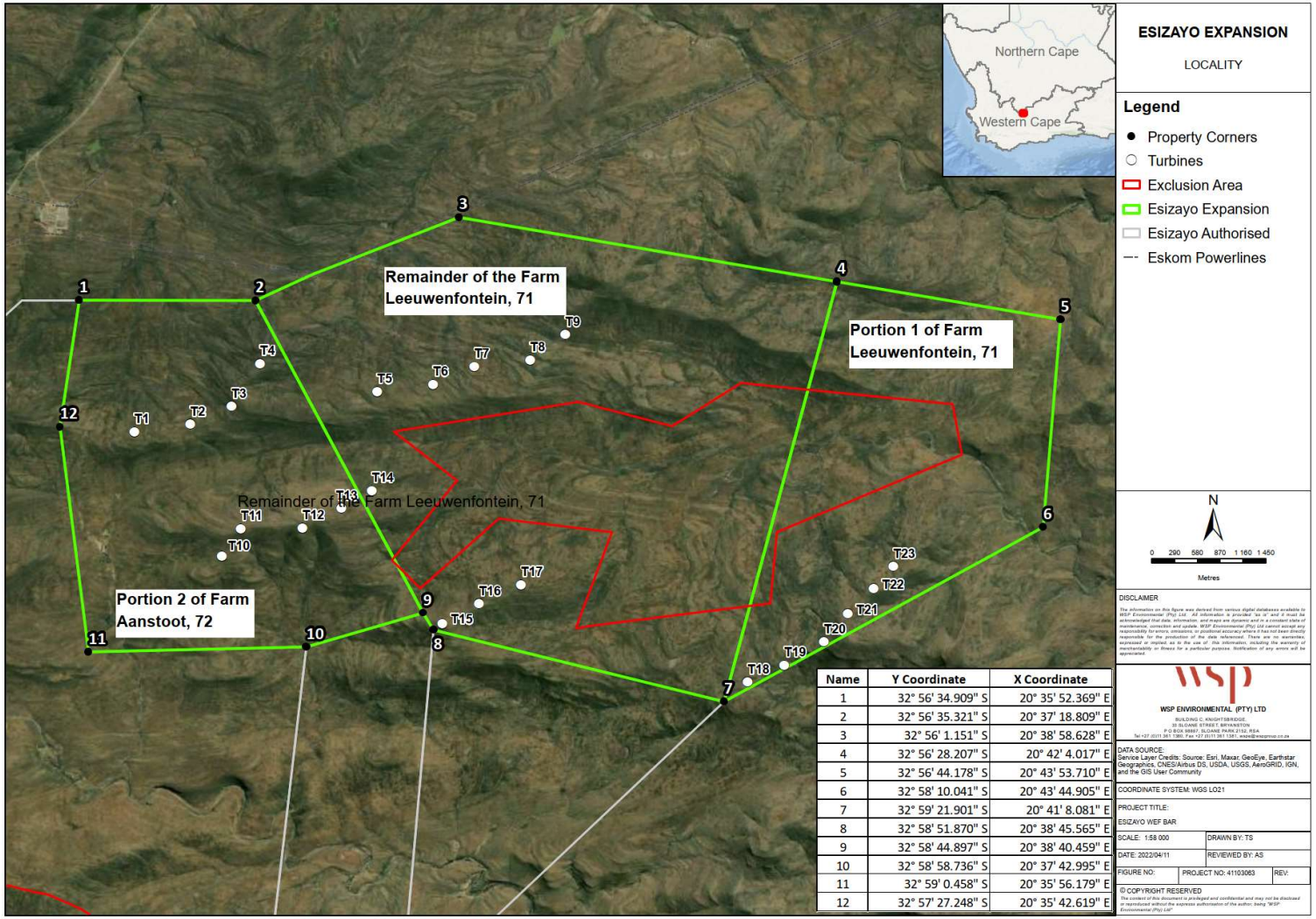
The Esizayo WEF Expansion Project lies approximately 30km north-west of Laingsburg in the Western Cape, and falls within the Laingsburg Local Municipality, which is located within the Central Karoo District Municipality (**Figure 1-2)**.

On 16 February 2018, the Department of Environmental Affairs (DEA), now the Department of Forestry, Fisheries and the Environment (DFFE), gazetted the Renewable Energy Development Zones (REDZ) and Strategic Transmission Corridors and procedures for the assessment of large-scale wind and solar photovoltaic energy development activities (Government Notice (GN) 114) and grid infrastructure (GN 113). The proposed Esizayo WEF Expansion Project falls within the Central Strategic Transmission Corridor as well as the Komsberg REDZ.

The WEF falls within a Critical Biodiversity Areas (CBA 1) and Ecological Support Areas (ESA 1 and ESA 2), according to the Western Cape CBA map (2016) (**Figure 1-3**), and falls within the Western Karoo National Protected Area Expansion Strategy (NPAES) focus area (**Figure 1-4**).

The proposed Esizayo WEF Expansion requires an EA in terms of the National Environmental Management Act (Act 107 of 1998), as amended (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (2014, as amended).

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Esizayo as the independent Environmental Assessment Practitioner (EAP) to facilitate the Basic Assessment (BA) process in accordance with the EIA Regulations (2014, as amended).



Name	Y Coordinate	X Coordinate
1	32° 56' 34.909" S	20° 35' 52.369" E
2	32° 56' 35.321" S	20° 37' 18.809" E
3	32° 56' 1.151" S	20° 38' 58.628" E
4	32° 56' 28.207" S	20° 42' 4.017" E
5	32° 56' 44.178" S	20° 43' 53.710" E
6	32° 58' 10.041" S	20° 43' 44.905" E
7	32° 59' 21.901" S	20° 41' 8.081" E
8	32° 58' 51.870" S	20° 38' 45.565" E
9	32° 58' 44.897" S	20° 38' 40.459" E
10	32° 58' 58.736" S	20° 37' 42.995" E
11	32° 59' 0.458" S	20° 35' 56.179" E
12	32° 57' 27.248" S	20° 35' 42.619" E

Figure 1-1: Regional location of the proposed Esizayo WEF Expansion Project

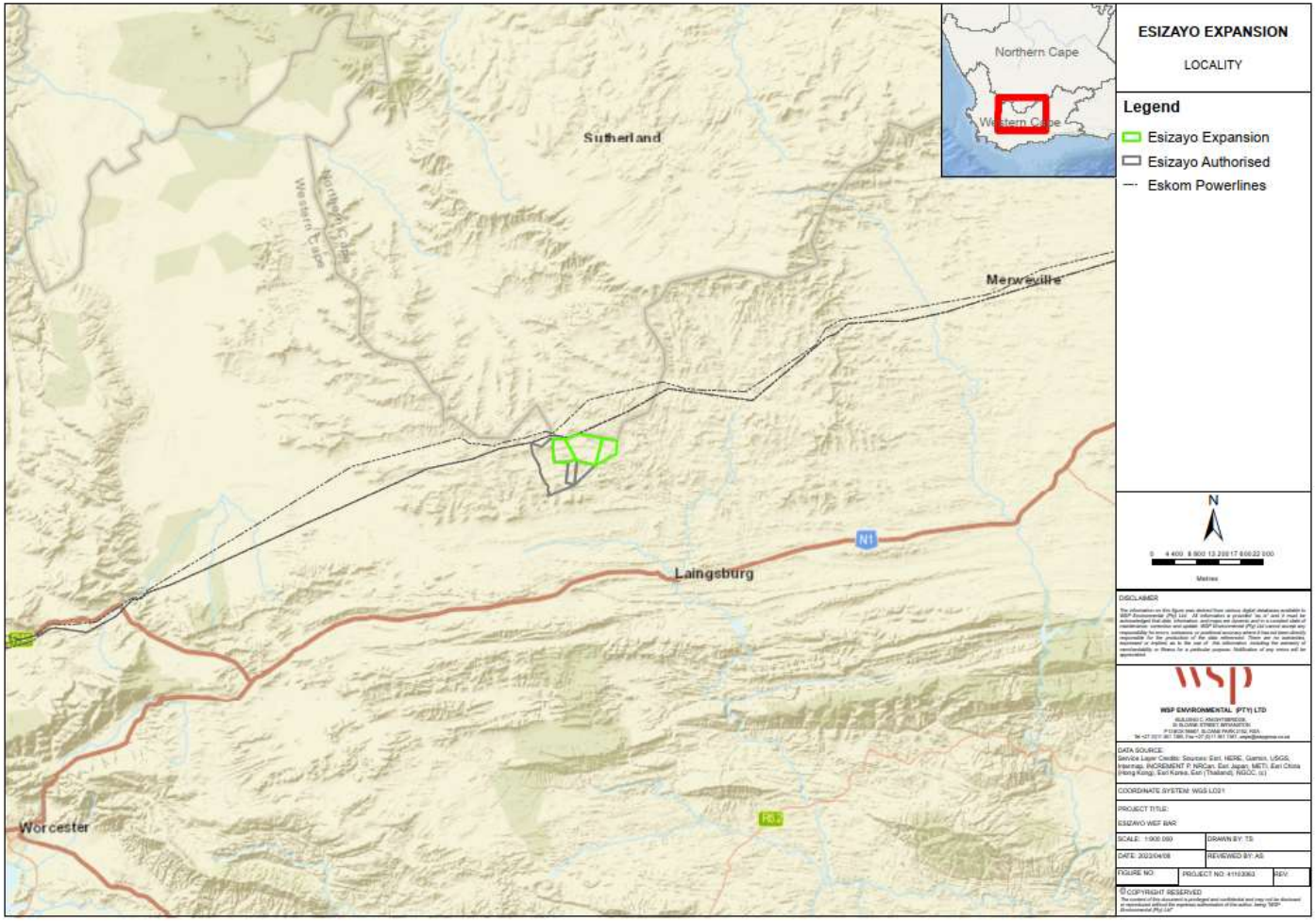


Figure 1-2: Regional location of the proposed Esizayo WEF Expansion Project showing the authorised WEF and proposed expansion

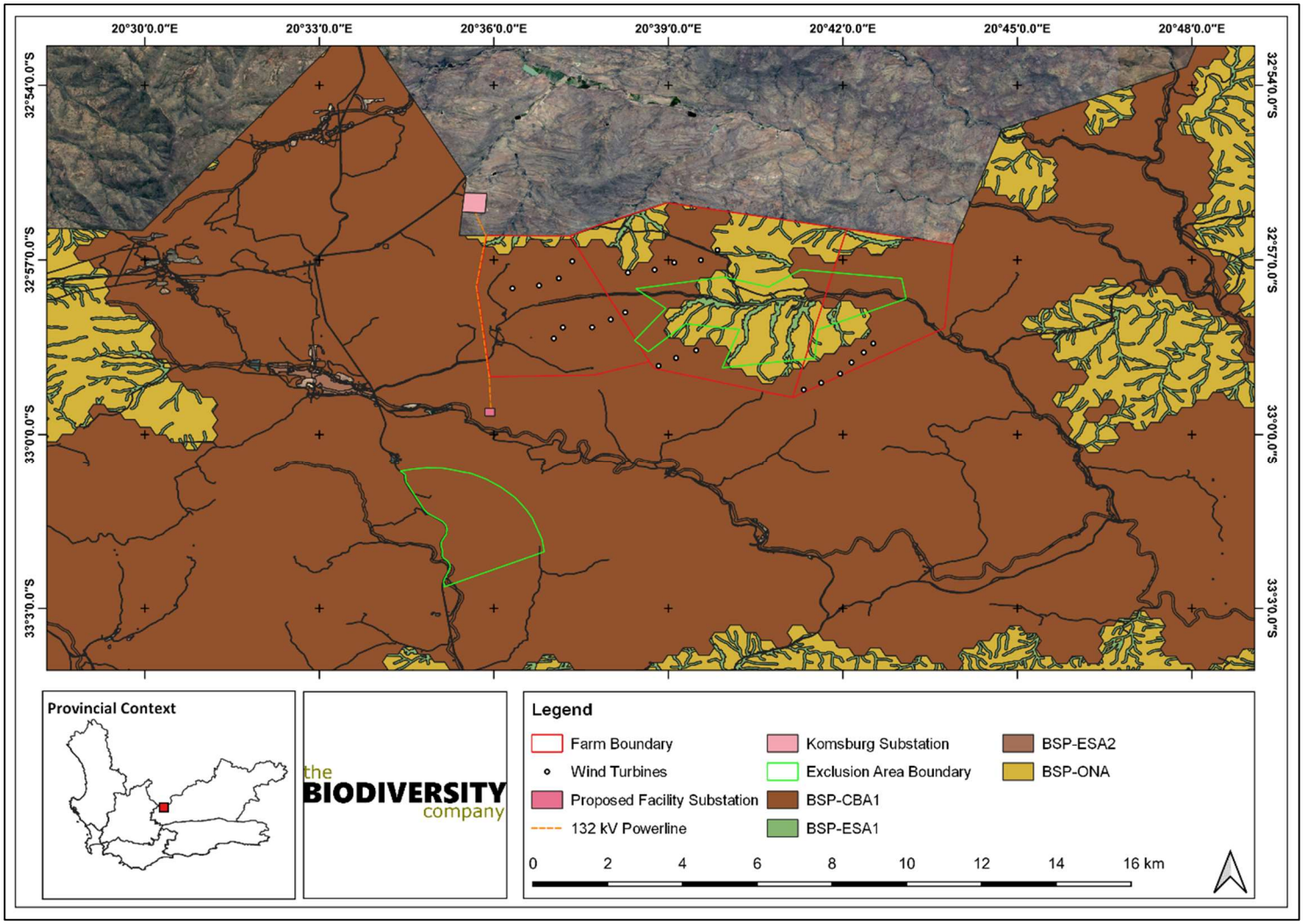


Figure 1-3: Critical Biodiversity Areas (CBA) and Ecological Sensitive Areas (ESA) proximal to the proposed project area.

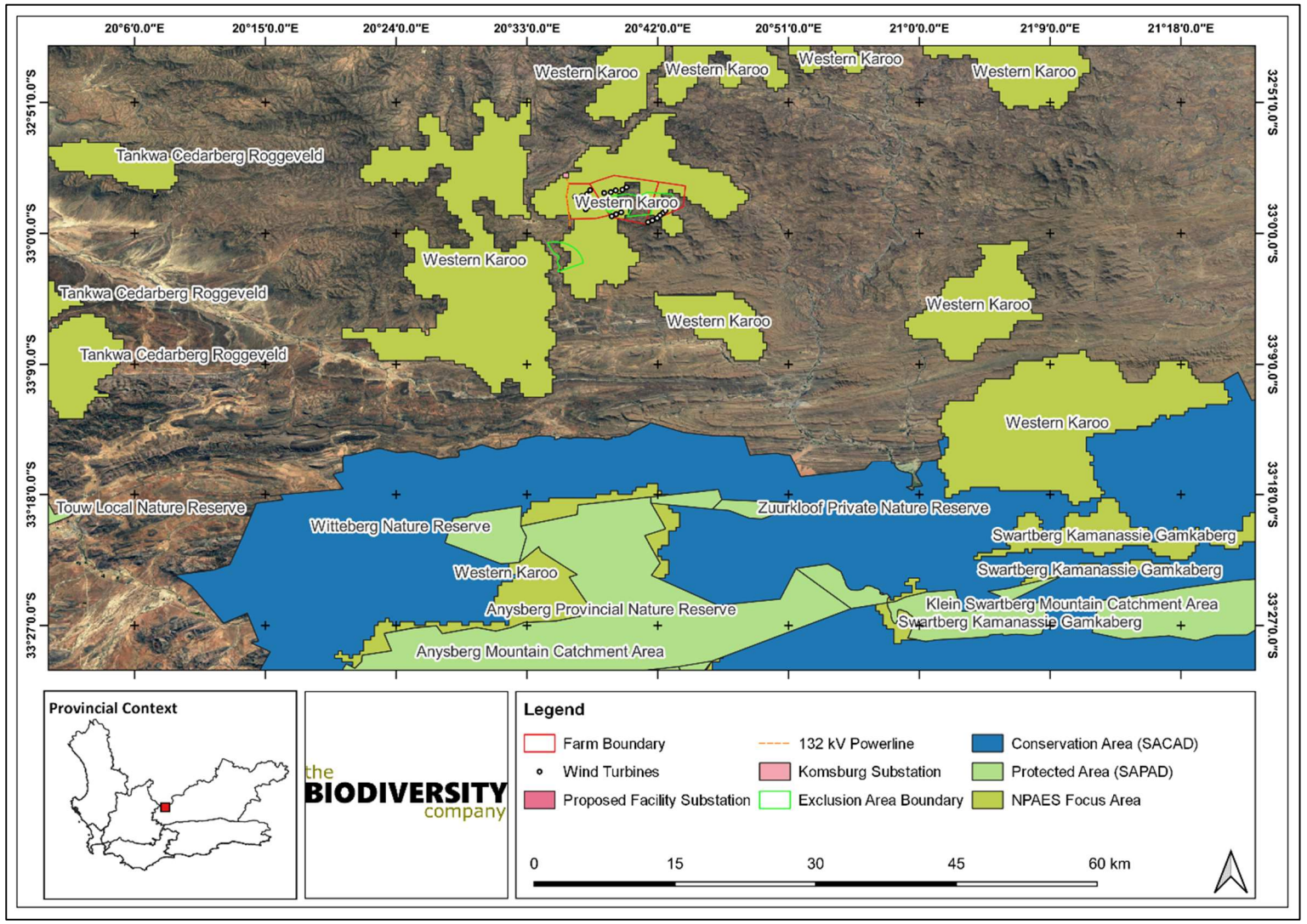


Figure 1-4: The project area in relation to the National Protected Area Expansion Strategy

1.2 PURPOSE OF THE BA PROCESS

The BA process is an interdisciplinary procedure to ensure that environmental and social considerations are included in decisions regarding projects. Simply defined, the process aims to identify the possible environmental and social effects of a proposed activity and how those impacts can be mitigated. In the context of this report, the purpose of the BA process is to inform decision-makers and the public of potential negative and positive consequences of the proposed construction of the Esizayo WEF Expansion project. This provides the competent authority (CA) sufficient information to make an informed decision with regards to granting or refusing the EA applied for.

1.3 DETAILS OF KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Esizayo Wind (RF) (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the proposed Esizayo WEF Expansion project. **Table 1-1** provides the relevant details of the project proponent.

Table 1-1: Details of Project Proponent

PROPONENT: ESIZAYO WIND (RF) (PTY) LTD

Contact Person:	Werner Engelbrecht
Postal Address	Building 1, Leslie Ave East Design Quarter District, Fourways P O Box 69408, Bryanston 2021
Telephone:	011 367 4644
Email:	eiaadmin@biothermenergy.com

1.3.2 COMPETENT AND COMMENTING AUTHORITIES

Section 24C(2)(a) of NEMA stipulates that the Minister of Forestry, Fisheries and the Environment ("the Minister") must be identified as the competent authority if the activity has implications for international environmental commitments or relations. GN 779 of 01 July 2016 identifies the Minister as the CA for the consideration and processing of environmental authorisations and amendments thereto for activities related the Integrated Resource Plan (IRP) 2010 – 2030. The DFFE is the CA for the proposed Esizayo WEF Expansion project.

Table 1-2 provides the relevant details of the competent authority for the Project.

The commenting authorities for the project include:

- Department of Energy (DoE);
- Department of Agriculture (DoA);
- Department of Rural Development and Land Reform (DRDLR);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected Areas;

- Department of Water & Sanitation (DWS);
- Department of Public Works;
- Department of Science and Technology;
- South African National Roads Agency (SANRAL);
- Western Cape Department of Environmental Affairs and Development Planning (WC DEADP);
- Cape Nature;
- Heritage Western Cape (HWC);
- South African Heritage Resources Agency (SAHRA);
- Karoo Hoogland Local Municipality; and
- Laingsburg Local Municipality.

Table 1-2: Competent Authority Details

ASPECT	COMPETENT AUTHORITY	CONTACT DETAILS
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Thembisile Hlatshwayo Integrated Environmental Authorisations: National Infrastructure Projects

1.3.3 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP was appointed in the role of Independent EAP to undertake the BA processes for the proposed construction of the wind energy facility. The CV of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-3** details the relevant contact details of the EAP.

Table 1-3: Details of the EAP

EAP	WSP GROUP AFRICA (PTY) LTD
Contact Person:	Ashlea Strong
Physical Address:	Building C, Knightsbridge, 33 Sloane Street, Bryanston, Johannesburg
Postal Address:	P.O. Box 98867, Sloane Park 2151, Johannesburg
Telephone:	011 361 1392
Fax:	011 361 1301
Email:	Ashlea.Strong@wsp.com

STATEMENT OF INDEPENDENCE

Neither WSP nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any business, financial, personal or other interest that could be reasonably regarded as being capable of affecting their independence. WSP has no beneficial interest in the outcome of the assessment.

1.4 SPECIALISTS

Specialist input was required in support of this application for EA. The details of the specialists are provided in **Table 1-4** below. The Curriculum Vitae of the specialists are attached in **Appendix F** and their declarations in **Appendix C**.

Table 1-4: Details of Specialists

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT	SPECIALIST REPORT ATTACHED AS
Avifauna	Chris van Rooyen	Chris van Rooyen	Section 6.1.13 Section 7.8 Section 9.1 & 9.2	Appendix F1
Biodiversity (including Bats)	Andrew Husted	The Biodiversity Company	Section 6.1.8, 6.1.9, 6.1.10, 6.1.11 & 6.1.12 Section 7.6 & 7.7 Section 9.1 & 9.2	Appendix F2
Heritage	John Gribble	ACO Associates CC	Section 6.2.3 & 6.2.5 Section 7.12 Section 9.2	Appendix F3
Palaeontology	John Almond	Natura Viva	Section 6.2.4 Section 7.13 Section 9.1 & 9.2	Appendix F4
Socio-economic	Tony Barbour	Independent consultant	Section 6.2.1 & 6.2.2 Section 7.14 Section 9.2	Appendix F5
Soils	Karen King	WSP	Section 6.1.5 Section 7.3 Section 9.2	Appendix F6
Hydrological	Karen King	WSP	Section 6.1.6 Section 7.5 Section 9.2	Appendix F7
Wetland Delineation	Karen King	WSP	Section 6.1.7 Section 7.4 Section 9.1 & 9.2	Appendix F8
Traffic	Christo Bredenhann	WSP	Section 6.2.7 Section 7.11 Section 9.2	Appendix F9
Visual	Lourens Du Plessis	LOGIS	Section 6.2.6 Section 7.9 Section 9.1 & 9.2	Appendix F10

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT	SPECIALIST REPORT ATTACHED AS
Noise	Kirsten Collett	WSP	Section 6.2.8 Section 7.2 Section 9.2	Appendix F11

1.5 BASIC ASSESSMENT REPORT STRUCTURE

The structure of the draft BAR (this report) is presented in **Table 1-5**.

Table 1-5: Structure of this report

SECTION	CONTENTS
1 – Introduction	Provides a brief background and outlines the purpose of this document, as well as identifying the key role players, content of the report and the assumptions and limitations applicable to the assessment.
2 – Governance Framework	Provides a brief summary and interpretation of the relevant legislation in terms of the proposed project.
3 – Basic Assessment Process	Provides a description of the BA process being undertaken and the methodology employed.
4 – Project Description	Describes the project location and surrounding area, project history, and a project description.
5 – Project Alternatives	Provides a summary description of the proposed project alternatives.
6 – Baseline Environment	Describes the biophysical and socio-economic characteristics of the affected environment against which potential project impacts are assessed.
7 – Environmental Impact Assessment	Describes the specialist studies undertaken and assesses the potential impacts of the project as well as project alternatives. The significance of the impacts and proposed mitigation measures are presented.
8 – Cumulative Impact Assessment	Describes the cumulative impacts identified by the EAP and Specialists and assesses the cumulative impacts. The significance of the impacts and proposed mitigation measures are presented.
9 – Environmental Impact Statement	Provides the Environmental Impacts Statement including principal findings as well as recommendations and the authorisation opinion.
10 –Way Forward	Outlines the stakeholder engagement details associated with the public review period.

2 GOVERNANCE FRAMEWORK

2.1 NATIONAL LEGAL AND REGULATORY FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 2-1** and

Table 2-2.

Table 2-1: Applicable Legislation

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
The Constitution of South Africa (No. 108 of 1996)	Section 24(b) of the Constitution provides that "*everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation [and] promote conservation.*" The Constitution cannot manage environmental resources as a stand-alone law, hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	In terms of Section 24(2) of the National Environmental Management Act (No. 107 of 1998) (NEMA), the Minister may identify activities which may not commence without prior authorisation. On 7 April 2017, the Minister amended GNR 327 (Listing Notice 1), 325 (Listing Notice 2) and 324 (Listing Notice 3) listing activities that may not commence prior to authorisation. The regulations outlining the procedures required for authorisation are published in GNR 326 EIA Regulations (2014, as amended). Listing Notice 1 and Listing Notice 3 identify activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require a Scoping and EIA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. **Listed Activities 12, 19, 24, 28, 48 and 56 of GNR 327 and Listed Activities 1 and 15 of GNR 325 and Listed Activities 4, 10, 12, 14, 18 and 23 of GNR 324 (as amended)** are considered applicable to the Esizayo WEF Expansion project and therefore, a BA process must be followed to obtain an EA.
Listing Notice 1: GNR 327	***Activity 12 (ii), (a) and (c):*** *The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse* **Applicability:** The construction of Esizayo WEF Expansion Project will result in construction activities occurring within 32 m of a watercourse with specific reference to internal access roads and powerlines that will need to traverse watercourses.

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	Activity 19 *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.* **Applicability:** The construction of Esizayo WEF Expansion Project will result in construction activities occurring within 32 m of a watercourse with specific reference to internal access roads and powerlines that will need to traverse watercourses.
	Activity 24 (ii): *The development of-* *(ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* **Applicability:** Internal access roads will be required for access to Esizayo WEF Expansion Project. These roads will be between 4 m and 8 m wide depending on final design.
	Activity 28 (ii): *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;* **Applicability:** Esizayo WEF Expansion Project is proposed to be developed outside an urban area with a development footprint of approximately 200 ha (including turbine hard standings, internal access roads and powerlines).
	Activity 48(i)(a)(c) *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **Applicability:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 100m^2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site.
	Activity 56 (ii): *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 km-* *(ii) where no reserve exists where the existing road is wider than 8 metre*

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	Applicability: Internal access roads will be required for access to Esizayo WEF Expansion Project. Where existing roads can be utilised, these roads will require widening by up to 8 m.
Listing Notice 2: GNR 325	***Activity 1:*** *The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.* **Applicability:** The Esizayo WEF Expansion Project will generate electricity from a renewable resource (wind) with an electricity output of up to 200 MW.
	Activity 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.* **Applicability:** The Esizayo WEF Expansion Project is proposed to be developed outside an urban area with a total development infrastructure footprint of approximately 200 ha (including turbine hard standings, internal access roads and powerlines).
Listing Notice 3: GNR 324 (as amended)	***Activity 4 (i)(ii)(aa):*** *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *(i) Western Cape-* *(ii) Areas outside urban areas* *(aa) containing indigenous vegetation* **Applicability:** Internal access roads will be required for access to Esizayo WEF Expansion. These roads will be between 4 m an 8 m. The Esizayo WEF Expansion Project overlaps Critical Biodiversity Area (CBA 1) and Ecological Support Areas (ESA 1 and 2) as classified by the Western Cape Biodiversity Spatial Plan (2017) (as adopted by the WC DEADP). Furthermore the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area.
	Activity 10(g)(i): *The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres —* *(g) in Western Cape:* *(i). Areas outside urban areas* **Applicability:**

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	Esizayo WEF Expansion Project will require the storage of more than 30 m^3 of dangerous goods on site during the construction phase. The project is located outside an urban area. The dangerous goods referred to above will include cement and fuel such as diesel that will be required on site during the construction phase in quantities of more than 30m^3
	Activity 12 (i) (i) and (ii): *The clearance of an area of 300 square metres or more of indigenous vegetation. Except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *i. Western Cape* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *ii. Within critical biodiversity areas identified in* *i. bioregional plans;* **Applicability:** The Esizayo WEF Expansion Project is proposed to be developed outside an urban area with a total development infrastructure footprint of approximately 200 ha (including turbine hard standings, internal access roads and powerlines). The Esizayo WEF Expansion Project overlaps Critical Biodiversity Area (CBA 1) and Ecological Support Areas (ESA 1 and 2) as classified by the Western Cape Biodiversity Spatial Plan (2017) (as adopted by the WC DEADP). Furthermore the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area.
	Activity 14 (ii) (a) and (c) (i) (i) (bb) and (ff): *The development of—* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *(i) Western Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.* **Applicability:** The construction of Esizayo WEF Expansion Project will result in construction activities occurring within 32 m of a watercourse with specific reference to internal access roads and powerlines that will need to traverse watercourses. The Esizayo WEF Expansion Project overlaps Critical Biodiversity Area (CBA 1) and Ecological Support Areas (ESA 1 and 2) as classified by the Western Cape Biodiversity Spatial Plan (2017) (as adopted by the WC DEADP). Furthermore the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area.
	Activity 18 (i)(i)(aa): *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 km.*

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	(i) ln Western Cape: *i. All areas outside urban areas:* *(aa) Areas containing indigenous vegetation."* **Applicability:** Esizayo WEF Expansion Project may require the widening of existing internal access roads by between 4 m and 8 m. The project area is located outside an urban area containing indigenous vegetation.
	Activity 23 (ii)(a)(c)(i)(bb)(ff): *"The expansion of:* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more—* *where such expansion occurs:* *(a) within a watercourse; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse* *(i) in Western Cape:* *i. Outside an urban area* *(bb) National Protected Area Expansion Strategy Focus areas* *(fl) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans* **Applicability:** The construction of Esizayo WEF Expansion Project will result in construction activities occurring within 32 m of a watercourse with specific reference to internal access roads and powerlines that will need to traverse watercourses. The Esizayo WEF Expansion Project overlaps Critical Biodiversity Area (CBA 1) and Ecological Support Areas (ESA 1 and 2) as classified by the Western Cape Biodiversity Spatial Plan (2017) (as adopted by the WC DEADP). Furthermore the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area.
National Environmental Management Biodiversity Act (No. 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) was promulgated in June 2004, within the framework of NEMA, to provide for the management and conservation of national biodiversity. NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, and the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In addition, NEMBA provides for the establishment and functions of the South African National Biodiversity Institute (SANBI). SANBI was established primarily to report on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems. The construction of the proposed wind energy facility expansion, including the associated infrastructure may negatively impact on the biodiversity of the area, even though the facility is within one of the Renewable Energy Development Zone (REDZs). As such, SANBI will be invited to provide comment on the proposed project and any licenses or permits that maybe applicable will be obtained. SANBI revised the Western Cape datasets during 2017 identifying CBAs as well as ecological support areas and published the 2017 Western Cape Biodiversity Spatial Plan (WCBSP). The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding to meet national biodiversity objectives. As the proposed Esizayo WEF Expansion project traverses both CBA and ESAs, a biodiversity impact assessment has been undertaken as part of the BA Process. The Threatened or Protected Species (TOPS) Regulations were promulgated on 1 June 2007 in terms of Section 91(1)(g), (h) and (i) of NEMBA. TOPS aims to further regulate

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	the permit system set out in NEMBA, provide for the prohibition and regulation of restricted activities, and provide for the protection of wild populations of listed and threatened or protected species. The minister published amendments to the TOPS on 29 April 2014, which was updated to include for the regulations and registration of a number of activities for the capture, farming and handling of threatened or protected species (e.g., captive breeding facilities, sanctuaries, game farms and nurseries). The Conservation of Agricultural Resources Act (No. 43 of 1993) (CARA) Regulations with regards to alien and invasive species have been superseded by the NEMBA- Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
National Environmental Management Protected Areas Act (No. 57 of 2003)	The purpose of the National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) is to, inter alia, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas. Section 50(5) of NEMPAA states that "*no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority*." The Esizayo WEF Expansion project does not fall within any proclaimed protected areas as per NEMPAA. The Witteberg Nature Reserve, Anysberg Provincial Nature Reserve and Zuurkloof Private Nature Reserve are located approximately 35 km to the south. The WEF does however traverse a CBA and falls within a NPAES Focus Area, namely the Western Karoo focus area.
National Water Act (No. 36 of 1998)	The purpose of the National Water Act (No. 36 of 1998) (NWA) is to provide a framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are national resources, which cannot be owned by any individual, and rights to which are not automatically coupled to land rights, but for which prospective users must apply for authorisation and register as users. The NWA also provides for measures to prevent, control and remedy the pollution of surface and groundwater sources. The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21), which may impact on water resources through the categorisation of 'listed water uses.' Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or Water Use Licence (WUL) authorisation. The proposed WEF Expansion has several watercourse crossings. The proposed development will encroach into the 100 m GN509 regulated area, thus Water Use Authorisation (WUA) from the DWS is required prior to commencement of any construction, in the form of either a general authorisation (GA) or a water use licence (WUL) will be required prior to commencement of any construction.
National Heritage Resources Act (No. 25 of 1999)	The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resource Agency (SAHRA) and lists activities which require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development. In terms of the Section 38 of NHRA, any person who intends to undertake a linear development including, inter alia, a powerline, exceeding 300m in length or a development that exceeds 5000m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority. In the case of the proposed wind energy facility, a Heritage Impact Assessment (HIA) will be undertaken looking at Archaeology, Heritage and Palaeontology. The proposed project will be brought to the attention of SAHRA, as well as the provincial Heritage Resource Agencies, who will provide comment, and provide the required approval.

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	Construction activities should be conducted carefully, and all activities ceased if any archaeological, cultural and heritage resources are discovered. SAHRA and HWC should be notified, and investigation conducted in accordance with the Chance Find Procedure to be established for the Project before any activities can commence. If any evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA must be alerted as per section 35(3) of the NHRA. Additionally, if unmarked human burials are uncovered SAHRA must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section 35(3) and section 36(3) of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.
National Environmental Management Waste Act (No. 59 of 2008)	The National Environmental Management Waste Act (No. 59 of 2008) (NEMWA) is subsidiary and supporting legislation to NEMA. NEMA is a framework legislation that provides the basis for the regulation of waste management. NEMA also contains policy elements and gives a mandate for further regulations to be promulgated. It is anticipated that activities on the site will not trigger the NEM:WA. However, waste handling, storage and disposal during the construction and operational phase of the project must be undertaken in accordance with the requirements of this Act and the Best Practicable Environmental Option (BPEO) which will be incorporated into the site specific Environmental Management Programme (EMPr). Adherence to Part 5 of NEMWA, which deals with the storage, collection and transportation of waste, must be adhered to during both construction and operation of the Project.
National Environment Management Air Quality Act (No. 39 of 2004)	The National Environment Management: Air Quality Act (No. 39 of 2004) (NEMAQA) came into effect on 11 September 2005. Persons undertaking such activities listed under GNR 893, as amended, are required to possess an Atmospheric Emissions License (AEL). The NEM:AQA aims to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in South Africa, to prevent air pollution and ecological degradation and to secure ecological sustainable development while promoting justifiable economic and social development. The National Dust Control Regulations (GNR 827) were promulgated, which aim at prescribing general measures for the control of dust in both residential and non-residential areas. Although no AEL will be required for the construction and operation of the WEF, the dust control regulations will be applicable during construction.
Conservation of Agricultural Resources Act (No. 43 of 1983)	The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) provides for the implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas. In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DFFE and the DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners' cost and risk. The CARA Regulations with regards to alien and invasive species have been superseded by NEMBA Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
Civil Aviation Act (No. 13 of 2009)	Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by SACAA as an agency of the Department of Transport (DoT).

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
	SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations. As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. The Sutherland Aerodrome is approximately 50 km northeast of the WEF. The DEA Screening Tool Report identified Civil Aviation as having low sensitivity for the proposed WEF Expansion Project. An Application for the Approval of Obstacles will also be submitted to ATNS. SACAA will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.
Occupational Health and Safety Act (No. 85 of 1993)	The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed project. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.
National Energy Act (No. 34 of 2008)	The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantitates, and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good. The main objectives of the Act are to: — Ensure uninterrupted supply of energy to the Republic; — Promote diversity of supply of energy and its sources; — Facilitate effective management of energy demand and its conservation; — Promote energy research; — Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy; — Ensure collection of data and information relating to energy supply, transportation and demand; — Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development; — Provide for certain safety, health and environment matters that pertain to energy; — Facilitate energy access for improvement of the quality of life of the people of Republic; — Commercialise energy-related technologies; — Ensure effective planning for energy supply, transportation, and consumption; and — Contribute to sustainable development of South Africa's economy. In terms of the act, the Minister of Energy is mandated to develop and, on an annual basis, review and publish the Integrated Energy Plan (IEP) in the Government Gazette. The IEP analyses current energy consumption trends within different sectors of the economy (i.e., agriculture, commerce, industry, residential and transport) and uses this to project future energy requirements, based on different scenarios. The IEP and the Integrated Resource Plan are intended to be updated periodically to remain relevant. The framework is intended to create a balance between energy demand and resource availability so as to provide low-cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

APPLICABLE LEGISLATION	DESCRIPTION OF LEGISLATION
Electricity Regulation Act (No. 4 of 2006)	The Electricity Regulation Act (No. 4 of 2006) (ERA) aims to: — Achieve the efficient, effective, sustainable, and orderly development and operation of electricity supply infrastructure in South Africa; — Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency. effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic: — Facilitate investment in the electricity supply industry; — Facilitate universal access to electricity; — Promote the use of diverse energy sources and energy efficiency; — Promote competitiveness and customer and end user choice; and — Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

Table 2-2: Applicable Policies

APPLICABLE POLICY	DESCRIPTION OF POLICY
National Development Plan	The National Development Plan (NDP) aims to eliminate poverty and reduce inequality by 2030. The NDP identifies a number of enabling milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing citizens with the means to improve their own lives and boost their incomes. Infrastructure is essential to development. Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges. In terms of implementation the NDP identifies three phases. The first two are of specific relevance to the proposed project. The first phase (2012–2017) notes that ensuring the supply of energy and water is reliable and sufficient for a growing economy. The second phase (2018–2023) involves building on the first phase to lay the foundations for more intensive improvements in productivity. The provision of affordable and reliable energy is a key requirement for this to take place. Chapter 4, Economic infrastructure, notes that economic infrastructure provides the foundation for social and economic development. In this regard South Africa must invest in a strong network of economic infrastructure designed to support the country's medium- and long-term economic and social objectives. The plan envisages that, by 2030, South Africa will have an energy sector that promotes: — Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. — Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. More specifically, South Africa should have adequate supply security in electricity and in liquid fuels, such that economic activity, transport, and welfare are not disrupted.

APPLICABLE POLICY	DESCRIPTION OF POLICY
	The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation. In this regard coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources, will play a much larger role.
Integrated Resource Plan 2010 – 2030	The integrated resource plan (IRP) is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. On 6 May 2011, the then Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. The IRP recognises that Solar photovoltaic (PV), wind and concentrated solar power (CSP) with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.
New Growth Path	Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: energy, transport, communication, water and housing.
National Infrastructure Plan	The South African Government adopted a National Infrastructure Plan (NIP) in 2012. The NIP aims to transform the South African economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, ***electricity plants***, hospitals, schools and dams will contribute to improved economic growth.
Strategic Integrated Projects	As part of the NIP and in terms of Section 8(1)(a) read with Section 7(1) of the Infrastructure Development Act, as amended (Act 23 of 2014), large-scale infrastructure projects, known as Strategic Integrated Projects (SIPs), have been identified across all nine provinces. Eighteen (18) SIPs have been prioritised as part of the NIP. SIPs cover catalytic projects that can fast-track development and growth. Work is being aligned with key cross-cutting areas: human settlement planning and skills development. The SIPs comprise: — Five Geographically focussed SIPs (SIP 1 to 5); — Three Spatial SIPs (SIP 6, 7 and 11); — Three Energy SIPs (SIP 8 to 10); — Three Social Infrastructure SIPs (SIP 12 to 14); — Two Knowledge SIPs (SIP 15 and 16); — One Regional Integration SIP (SIP 17); and — One Water and Sanitation SIP (SIP 18).

APPLICABLE POLICY	DESCRIPTION OF POLICY
	SIP 8: Green energy in support of the South African economy aims to "*support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP2010) and to support bio-fuel production facilities.*" By March 2016 a total of 6 376 MW of renewable energy had been procured from 102 independent power producers under the Independent Power Producer Procurement. The REDZs were identified to support SIP 8 of the National Infrastructure Plan. **SIP 9: Electricity generation to support socio-economic development** aims to "*accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 and updated draft IRP 2018 to meet the needs of the economy and address historical imbalances.*" **SIP 10: Electricity Transmission and Distribution for All** aims to "*expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development*" in South Africa. SIP 10 recognises that a reliable transmission network with adequate capacity to meet customer needs is a fundamental condition for the provision of a reliable electricity supply in South Africa. To remain reliable, the transmission system requires not only maintenance, but must also be developed and expanded to meet changing electricity demand and energy generation requirements. A reliable transmission network and an effective process for enabling network expansion, is therefore critical to the realisation of development plans and services, including job creation, the provision of quality education and health care, and the upliftment of previously disadvantaged communities. The Strategic Environmental Assessment (SEA) for Electricity Grid Infrastructure (EGI) in South Africa (CSIR, 2016) identified five Strategic Transmission Corridors that are of strategic importance for the rollout of the supporting large-scale electricity transmission and distribution infrastructure in terms of SIP 10. The EGI SEA identified the optimal location for strategic corridors where transmission infrastructure expansion is needed to enable the regionalised balancing of future demand and supply requirements, whilst minimising negative impacts to the environment. GN 145 approved the Strategic Transmission Corridors, which support areas where long-term electricity grid infrastructure will be developed and where an integrated decision-making process for applications for EA in terms of NEMA will be followed. Applications for EA for large scale electricity transmission and distribution facilities, when such facilities trigger Activity 9 of Listing Notice 2 of the EIA Regulations (2014, as amended) and any other listed activities necessary for the realisation of such facilities, and where the greater part of the proposed facility is to occur in one or more such Strategic Transmission Corridors, must follow a BA procedure (and not a full S&EIA). The timeframe for decision-making is 57 days. Routes that have been pre-negotiated with landowners must be submitted as part of the application for an EA. The proposed Esizayo WEF Expansion Project falls within the Komsberg REDZ and the Central Strategic Transmission Corridor and will be subject to shorter decision-making timeframes as outlined in GN 145.
Integrated Energy Plan	The development of a National Integrated Energy Plan (IEP) was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives are identified, namely: — Objective 1: Ensure security of supply. — Objective 2: Minimise the cost of energy. — Objective 3: Promote the creation of jobs and localisation.

APPLICABLE POLICY	DESCRIPTION OF POLICY
	— Objective 4: Minimise negative environmental impacts from the energy sector. — Objective 5: Promote the conservation of water. — Objective 6: Diversify supply sources and primary sources of energy. — Objective 7: Promote energy efficiency in the economy. — Objective 8: Increase access to modern energy. The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e., agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and also take into account the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others. Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The IEP is therefore focused on determining the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives. As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios: — The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term. — The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy. — The Resource Constrained Scenario in which global energy commodity prices (i.e., coal, crude oil and natural gas) are high due to limited supply. — The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the NDP, are met. The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of existing electricity generation capacity, the IEP indicates that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth. By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs. In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy. An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered. In terms of promoting job creation and localisation potential the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller

APPLICABLE POLICY	DESCRIPTION OF POLICY
	contribution. The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.
National Protected Area Expansion Strategy, 2010	The National Protected Area Expansion Strategy 2010 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2010). The WEF Expansion Project falls within an NPAES focus area.

2.2 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

Table 2-3: Provincial and Municipal Legislation and Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Western Cape Spatial Development Framework	The Western Cape Provincial Spatial Development Framework, 2014 (PSDF) is an approved structure plan in terms of the Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA) and the Land Use Planning Act (Act 3 of 2014) (LUPA) and aims to give spatial expression to the NDP and One Cape 2040 initiatives. It provides guidelines for district, metropolitan and local municipal spatial initiatives such as Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs). The PSDF is a broad-based document and does not control development or land use proposals at a micro-scale (e.g., individual properties). It is, however, relevant in setting out overarching planning policy guidelines adopted by the Provincial Government, and major development applications need to take guidance from and be evaluated in terms of these policy guidelines. The Western Cape PSDF is underpinned by three interrelated themes, namely: — Sustainable use of the Western Cape's spatial assets (resources); — Opening up opportunities in the Provincial space-economy (space economy); and — Developing integrated and sustainable settlements (settlement). The WCPSDF also includes the following spatial agenda: — Grow the Province's economy in partnership with the private sector, non-government and community based organisations; — Use infrastructure investment as the primary lever to ensure urban and rural spatial transitions; and — Improve the sustainable use of the Province's spatial assets and resources. Key spatial challenges are outlined in Chapter 2 of the PSDF. Energy security and climate change response are identified as key high-level future risk factors. With regard to energy use, the PSDF notes that the Cape Metro (albeit the province's most efficient user) and West Coast regions are the Province's main energy users. It further notes that the Western Cape's electricity is primarily drawn from the national grid, which is dominated by coal-based power stations, and that the province currently has a small emergent renewable energy sector in the form of wind and solar generation facilities located in its more rural, sparsely populated areas. With regard to renewable energy, the following policy provisions are of relevance:

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— Policy R.4.6: Pursue energy diversification and energy efficiency in order for the Western Cape to transition to a low carbon, sustainable energy future, and delink economic growth from energy use. — R.4.7: Support emergent Independent Power Producers (IPPs) and sustainable energy producers (wind, solar, biomass and waste conversion initiatives) in suitable rural locations (as per recommendations of the Strategic Environmental Assessments for wind energy (DEA&DP) and renewable energy (DFFE). Water scarcity is identified as probably the key risk associated with climate change. Policy provisions are made with regard to climate change adaptation and mitigation. Concerning renewable energy, the following is of relevance: — R.4.16: Encourage and support renewable energy generation at scale.
Western Cape Infrastructure Framework	The Western Cape Infrastructure Framework (WCIF) (2013) was developed by the WCP Provincial Department of Transport and Public Works in terms of the Provincial Government's mandate to coordinate provincial planning under Schedule 5A of the Constitution. The objective of the WCIF is to align the planning, delivery and management of infrastructure to the strategic agenda and vision for the province, as outlined in the 2009-2014 Draft Provincial Strategic Plan. The One Cape 2040 and 2013 Green is Smart strategy were other key informants. The document notes that given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the 2-3 decades a new approach to infrastructure is needed. Namely one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome. The 2040 vision requires a number of transitions to shift fundamentally the way in which infrastructure is provided and the type of infrastructure provided in WCP. The WCIF addresses new infrastructure development under five major 'systems' (themes), and outlines priorities for each. Energy is one of the 'systems' identified. The document notes that a provincial demand increase of 3% per year is anticipated for the period 2012-2040. Key priorities are in matching energy generation/ sourcing with the demand needed for WCP economic growth. Additionally, the energy focus should be on lowering the provincial carbon footprint, with an emphasis on renewable and locally generated energy. Three key transitions are identified for the WCP Energy 'system' infrastructure, namely: — Shifting transport patterns to reduce reliance on liquid fuels. — Promoting natural gas as a transition fuel by introducing gas processing and transport infrastructure. — Promoting the development of renewable energy plants in the province and associated manufacturing capacity
Laingsburg Municipality Integrated Development Plan (2017 – 2022)	The LM IDP (2017-2022) identifies six priority area of which the following are relevant to the project: — Environmental and Spatial Development. — Local Economic Development. — Basic Service Delivery. — Social and Community Development. **Priority 1: Environmental and Spatial Development** The focus of Priority 1 is on creating a safe municipal area, the conservation of the town's heritage and, or relevance to the renewable energy sector, creating a clean green oasis in the Karoo. It also seeks to restore dignity in rural areas. A number of strategic objectives are associated with each of the priority areas listed in the IDP. **Priority 2: Local Economic Development** The focus of Priority 2 is on creating opportunities to ensure growth and development of the Laingsburg municipal economy. Of relevance to the renewable energy sector the IDP notes the commitment of the municipality create an enabling environment and incentives to attract

APPLICABLE PLAN	DESCRIPTION OF PLAN
	investment to the area. A number of strategic objectives are associated with each of the priority areas listed in the IDP. *Strategic Objective 2: Promote local economic development* The focus areas for supporting economic development and creating employment are the tourism sector and support for Small Medium Micro Enterprise Developments (SMME's). **Priority 3: Basic Service Delivery** The focus of Priority 3 is to maintain and improve current levels of service delivery in the LM. The IDP also notes that well maintained infrastructure also supports and promote local economic development. **Priority 4: Social and Community Development** The focus of Priority 4 is on promoting equal accessibility for available opportunities for all, especially the poor and the youth. Priority 4 also seeks to create opportunities for moral regeneration by implementing awareness programmes, skills development and training and the provision of free basic services. *Strategic Objective 4: Improve the standards of living of all people in Laingsburg* The IDP lists a number of projects associated with Strategic Objective 3, including implementation of a crime prevention and rehabilitation programme, establishment of ECD Centres, ensuring the effective operation of the towns Thusong Service Centre, and supporting old age facilities in the town. Improved living standards are also linked to a skilled and educated population. The IDP therefore highlights the need to improve overall literacy levels and create opportunities to support education and skills development and training. A SWOT Analysis undertaken as part of the IDP process lists the strengths, weaknesses, opportunities, and threats facing the LM. The following are relevant to the Needs Assessment. **Strengths** — Stable municipality. — Well-located in terms of access by road and rail. — Good infrastructure in place. — Nice clean town. — Strong, professional administration with professional. — Good public participatory and ward committee system. — Established tourism office. — Thusong Service Centre. **Weaknesses** — Narrow income base. — Small business sector. **Opportunities** — Establishment of economic development infrastructure. — Development of light industrial area. — Green Energy. — Training and Skills Development. — Establishment of organised Business sector **Threats** — Aging municipal infrastructure. — Climate change and drought. — High level of grant dependency. — Skills shortages and difficulty in retaining scarce skills.

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— Low literacy rates and high drop-out rates for school children. — Large distances to large towns. — Poor condition of gravel roads in rural areas. — High water losses from municipal infrastructure. The IDP highlights the threat posed by the impact of climate change, specifically given the key role played by the agriculture to the local economy. The key risks are linked to the long term rise in temperature, variability in precipitation and changes in precipitation patterns and growing season etc. The IDP notes that water availability is the most important limiting factor affecting the agriculture sector (crop and animal production) in the LM. Climate change therefore has the potential to impact on employment and food security.
Laingsburg Local Economic Development (LED) and Tourism Strategy (2019-2029)	The Laingsburg Local Economic Development (LED) and Tourism Strategy (2019-2029) is informed by and aligned with relevant national, provincial, district and local policies and plans, including the National Development Plan and Western Cape Strategic Plan (2019-2024). The aim of the LED and Tourism Strategy is to guides the long-term sustainable planning and development of the Laingsburg economy. This includes reducing poverty within the Laingsburg Municipal area. The LED strategy is based on the overall vision outlined in the IDP. The Strategy assesses the current socio-economic environment, outlines strategic goals for the next ten-years, it recommends a series of actions to achieves those goals by leveraging existing assets and strengths, overcoming existing weaknesses and threats, and developing new assets and strengths. The LED Strategy therefore identifies key socio-economic needs facing the LM and strategies to address these needs. The LED aims to create job opportunities by assisting the local economy to grow by developing more small business in the municipal area, specifically for HD members of the community. One of the key drivers for LED is tourism. Tourism has the ability and potential to create long-term work opportunities. The LED and Tourism Strategy identifies a number of key socio-economic trends, challenges and key considerations that have a bearing on the project. These include: — Climate changes poses a number of challenges to the agricultural sector in Western Cape, including the LM area. — Laingsburg as a drought prone area is faced with the increased competition for water resources from agricultural and other uses, including urban and industrial. — The Municipality will need to develop and implement strategies to address climate change and the impact of drought. The predicted increase in the frequency and severity of droughts will have a negative impact on agriculture. — Agriculture is the backbone of Laingsburg economy. However, the agriculture sector is not diverse, the dominant activity is sheep (wool and meat) farming. — There is a lack of formal employment, including self-employment opportunities, in the LM. — The LM has high unemployment rates, low-income levels, and high illiteracy rates. The high illiteracy rates are linked to the high percentage of school dropouts. This has resulted in high poverty rates and increasing levels of substance abuse in Laingsburg. — There is a shortage of skilled labour. — There is a high degree of grant dependency. The LED also identifies the development of a renewable energy centre as strategic initiative.

2.3 INTERNATIONAL STANDARDS AND GUIDELINES

2.3.1 IFC PERFOMANCE STANDARDS

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group (WBG) and is headquartered in Washington, D.C., United States. It was established in 1956 as the private sector arm of the WBG to advance economic development by investing in strictly for-profit and commercial projects that purport to reduce poverty and promote development.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that its projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC is owned and governed by its member countries but has its own executive leadership and staff that conduct its normal business operations. It is a corporation whose shareholders are member governments that provide paid-in capital, and which have the right to vote on its matters. Originally more financially integrated with the WBG, the IFC was established separately and eventually became authorized to operate as a financially autonomous entity and make independent investment decisions. It offers an array of debt and equity financing services and helps companies face their risk exposures, while refraining from participating in a management capacity. The corporation also offers advice to companies on making decisions, evaluating their impact on the environment and society, and being responsible. It advises governments on building infrastructure and partnerships to further support private sector development.

The IFC’s Sustainability Framework articulates the Corporation’s strategic commitment to sustainable development and is an integral part of IFC’s approach to risk management. The Sustainability Framework comprises IFC’s Policy and Performance Standards on Environmental and Social Sustainability, and IFC’s Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC’s commitments, roles, and responsibilities related to environmental and social sustainability. IFC’s Access to Information Policy reflects IFC’s commitment to transparency and good governance on its operations and outlines the Corporation’s institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs may also be applied by other financial institutions (FIs).

The Project is considered a Category B project in terms of the IFC Policy on E&S Sustainability (2012), having the potential to cause limited adverse environmental or social risks and/or impacts that are few in number, generally site specific, largely reversible, and readily addressed through mitigation measures.

The objectives and applicability of the eight PSs are outlined in

Table 2-4.

Table 2-4: Objectives and Applicability of the IFC Performance Standards

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts			
Overview	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.		
Objectives	— To identify and evaluate environmental and social risks and impacts of the project. — To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. — To promote improved environmental and social performance of clients through the effective use of management systems. — To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. — To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.		
Aspects	1.1	Policy	The IFC Standards state under PS 1 (Guidance Note 23) that "*the breadth, depth and type of analysis included in an ESIA must be proportionate to the nature and scale of the proposed project's potential impacts as identified during the course of the assessment process*." This document is the draft deliverable from the BA process undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been compiled and is included in **Appendix G**.
	1.2	Identification of Risks and Impacts	
	1.3	Management Programmes	
	1.4	Organisational Capacity and Competency	
	1.5	Emergency Preparedness and Response	
	1.6	Monitoring and Review	
	1.7	Stakeholder Engagement	
	1.8	External Communication and Grievance Mechanism	
	1.9	Ongoing Reporting to Affected Communities	
Performance Standard 2: Labour and Working Conditions			
Overview	Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.		
Objectives	— To promote the fair treatment, non-discrimination, and equal opportunity of workers. — To establish, maintain, and improve the worker-management relationship. — To promote compliance with national employment and labour laws. — To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. — To promote safe and healthy working conditions, and the health of workers. — To avoid the use of forced labour.		

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Aspects	2.1	— Working Conditions and Management of Worker Relationship — Human Resources Policy and Management — Working Conditions and terms of Engagement — Workers organisation — Non- Discrimination and Equal Opportunity — Retrenchment — Grievance Mechanism	PS2 is not considered highly applicable as construction activities will not be significant for a project of this nature and scale. This BAR and the EMPr, however, incorporate the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors. Formal human resource and labour policies will be compiled in the event that the project is developed in the future.
	2.2	— Protecting the Workforce — Child Labour — Forced Labour	
	2.3	Occupational health and Safety	
	2.4	Workers Engaged by Third Parties	
	2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.		
Objectives	— To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. — To promote more sustainable use of resources, including energy and water. — To reduce project related GHG emissions.		
Aspects	3.1	— Policy Resource Efficiency — Greenhouse Gases — Water Consumption	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in **Section 7** of this report. There are no material resource efficiency issues associated with the Project. Refer to the EMPr for general resource efficiency measures. The project is not GHG emissions intensive and a climate resilience study or a GHG emissions-related assessment is not deemed necessary for a project of this nature. Dust air pollution in the construction phase has been adequately addressed in the EMPr. The Project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr. Land contamination of the site from historical land use (i.e., low intensity agricultural / grazing) is not considered to be a cause for concern.
	3.2	— Pollution Prevention — Air Emissions — Stormwater — Waste Management — Hazardous Materials Management — Pesticide use and Management	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
			The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr. Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr identifies these anticipated hazardous materials and recommends relevant mitigation and management measures.
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	— To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. — To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities		
Aspects	4.1	— Community Health and Safety — Infrastructure and Equipment Design and Safety — Hazardous Materials Management and Safety — Ecosystem Services — Community Exposure to Disease — Emergency Preparedness and Response	The requirements included in PS 4 have been addressed in the BAR process and the development of the EMPr. The following generic plans have been included in the EMPr: — Emergency Response Plan; — Transport Management Plan; — HIV/AIDS Management Plan; and — Security Policy. All plans will be made site specific as part of the financial close process, in the event that the project is developed in the future. The location of the Esizayo WEF Expansion reduces the potential risk of electrocution and potential electromagnetic fields exposure. Standard safety and security measures and included in the EMPr.
	4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		
Objectives	— To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. — To avoid forced eviction. — To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. — To improve, or restore, the livelihoods and standards of living of displaced persons. — To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	— Displacement — Physical Displacement — Economic Displacement	PS5 is not applicable to the proposed Esizayo WEF Expansion Project as no physical or economic displacement or livelihood restoration will be required. The proposed Esizayo WEF Expansion Project is located on privately owned land that is utilised for agriculture by the

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
		— Private Sector Responsibilities under Government Managed Resettlement	landowners. The land will continue to be used for agriculture without impediment by the WEF Expansion Project.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	— To protect and conserve biodiversity. — To maintain the benefits from ecosystem services. — To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	Protection and Conservation of Biodiversity	The Esizayo WEF Expansion Project overlaps CBA and ESAs. A Biodiversity Impact Assessment and Freshwater Impact Assessment have been undertaken for the proposed Esizayo WEF Expansion Project. Refer to **Appendix F.** The methodologies for the specialist assessments included a combination of literature review, in-field surveys and sensitivity mapping. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa. The prevalence of invasive alien species on the site is low; however, the BAR process had noted the propensity for the spread of alien invasive species in the construction and operational phases and mitigation and management measures are included in the EMPr.
Performance Standard 7: Indigenous People			
Overview	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.		
Objectives	— To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. — To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. — To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. — To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. — To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. — To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Aspects	7.1	General — Avoidance of Adverse Impacts — Participation and Consent	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area.

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
	7.2	Circumstances Requiring Free, Prior, and Informed Consent — Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use — Critical Cultural Heritage — Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
	7.3	Mitigation and Development Benefits	
	7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	— To protect cultural heritage from the adverse impacts of project activities and support its preservation. — To promote the equitable sharing of benefits from the use of cultural heritage.		
Aspects	8.1	Protection of Cultural Heritage in Project Design and Execution	In accordance with prevailing national legislation, A Heritage NID will be submitted to Heritage Western Cape (HWC) for the project. A Heritage Impact Assessment has been undertaken as part of the BA process and is included as **Appendix F3**. A Chance Find Procedure is included in the EMPr (**Appendix G**).

2.3.2 EQUATOR PRINCIPLES

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs apply globally to all industry sectors and to five financial products 1) Project Finance Advisory Services, 2) Project Finance, 3) Project-Related Corporate Loans, 4) Bridge Loans and 5) Project-Related Refinance and Project-Related Acquisition Finance. The relevant thresholds and criteria for application is described in detail in the Scope section of the EP. Currently 118 Equator Principles Financial Institutions (EPFIs) in 37 countries have officially adopted the EPs, covering the majority of international project finance debt within developed and emerging markets. EPFIs commit to implementing the EPs in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EPs.

While the EPs are not intended to be applied retroactively, EPFIs apply them to the expansion or upgrade of an existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact. The EPs have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market.

The EPs have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry and have supported member banks in developing their own Environmental and Social Risk Management Systems.

The requirements and applicability of the EPs are outlined in **Table 2-5**. It should be noted that Principles 8 and 10 relate to a borrower's code of conduct and are therefore not considered relevant to the BA process and have not been included in this discussion.

Table 2-5: Requirements and Applicability of the Equator Principles

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
Principle 1: Review and Categorisation		
Overview	When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC. Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale, and stage of the Project, and with the level of environmental and social risks and impacts. The categories are: — Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented; — Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and — Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.	Based upon the significance and scale of the Project's environmental and social impacts, the proposed project is regarded as a Category B project i.e., a project with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
Principle 2: Environmental and Social Assessment		
Overview	For all Category A and Category B Projects, the EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and where residual impacts remain, to compensate/offset/remedy for risks and impacts to Workers, Affected Communities, and the environment, in a manner relevant and appropriate to the nature and scale of the proposed Project. The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. For other Category B and potentially C Projects, a limited or focused environmental or social assessment may be appropriate, applying applicable risk management standards relevant to the risks or impacts identified during the categorisation process. The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation.	This document is the draft deliverable from the BA process undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr has been compiled and is included in **Appendix G**.

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
Principle 3: Applicable Environmental and Social Standards		
Overview	The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project and transaction meet each of the Principles. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC PS and WBG EHS Guidelines. For Projects located in Designated Countries, compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.	As South Africa has been identified as a non-designated country, the reference framework for environmental and social assessment is based on the IFC PS. In addition, this BAR process has been undertaken in accordance with NEMA (the host country's relevant legislation).
Principle 4: Environmental and Social Management System and Equator Principles Action Plan		
Overview	For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
Principle 5: Stakeholder Engagement		
Overview	EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities Workers and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. To accomplish this, the appropriate assessment documentation, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation. Disclosure of environmental or social risks and adverse impacts should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. All Projects affecting Indigenous Peoples will be subject to a process of Informed Consultation and Participation and will need to comply with the rights and protections for Indigenous Peoples contained in relevant national law, including those laws implementing host country obligations under international law.	The BA process includes an extensive stakeholder engagement process which complies with the South African EIA Regulations. The process includes consultations with local communities, nearby businesses and a range of government sector stakeholders (state owned enterprises, national, provincial and local departments). The stakeholder engagement process solicits interest from potentially interested parties through the placement of site notices and newspaper advertisements as well as written and telephonic communication. The stakeholder engagement process is detailed in Section 3.6.
Principle 6: Grievance Mechanism		
Overview	For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate	The EMPr includes a *Grievance Mechanism Process for Public Complaints and Issues*. This procedure effectively allows for external communications with

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	resolution of concerns and grievances about the Project's environmental and social performance. The borrower will inform the Affected Communities and Workers about the grievance mechanism in the course of the stakeholder engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible, at no cost, and without retribution to the party that originates the issue or concern.	members of the public to be undertaken in a transparent and structured manner. This procedure will be revised and updated as part of the EMPr amendment process in the event that the project is developed in the future.
Principle 7: Independent Review		
Overview	For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.	This principle will only become applicable in the event that that the project is developed in the future.
Principle 9: Independent Monitoring and Reporting		
Overview	To assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting for all Category A, and as appropriate, Category B projects. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information, which will be shared with the EPFI in accordance with the frequency required.	This principle will only become applicable in the event that the project is developed in the future.

2.4 OTHER GUIDELINES AND BEST PRACTICE RECOMMENDATIONS

2.4.1 WORLD BANK GROUP ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES

EHS GENERAL GUIDELINES

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of GIIP. They contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The EHS General Guidelines contain information on cross-cutting environmental, health and safety issues potentially applicable to all industry sectors, used together with the relevant industry sector guideline(s), to guide the development of management and monitoring strategies for various project-related impacts.

EHS GUIDELINES FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

The Guidelines includes industry-specific impacts and management, provides a summary of EHS issues associated with electric power transmission and distribution that occur during the construction and operation phases of a facility, along with recommendations for their management. Additionally, it includes performance indicators and monitoring related to the environment an occupational health and safety.

These Guidelines have been considered in the impact assessment and formulation of mitigation measures in this BAR.

2.4.2 GENERIC EMPR RELEVANT TO AN APPLICATION FOR SUBSTATION AND OVERHEAD ELECTRICITY TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

NEMA requires that an EMPr be submitted where an EIA has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation. The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations, 2014, as amended, or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice, that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the applicant and the CA.

GN 435 of 22 March 2019 identified a generic EMPr relevant to applications for substations and overhead electricity transmission and distribution infrastructure which require authorisation in terms of Section 42(2) of NEMA. Applications for overhead electricity transmission and distribution infrastructure that trigger Activity 11 of Listing Notice 1 or Activity 9 of Listing Notice 2, and any other listed or specified activities must use the generic EMPr.

The objective of the generic EMPr is "to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of overhead electricity transmission and distribution infrastructure. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature."[1]

The generic EMPrs are applicable to the Esizayo WEF project as a whole and have been included in the EMPr for the relevant Grid Connection which has been undertaken as a separate application.

[1] DEA (2019) *Appendix 1: Generic Environmental Management Programme (EMPr) for the Development and Expansion for Overhead Electricity Transmission and Distribution Infrastructure*

3 BASIC ASSESSMENT PROCESS

3.1 OBJECTIVES OF THE BASIC ASSESSMENT PROCESS AS PER THE PROCEDURAL FRAMEWORK

As defined in Appendix 1 of the EIA Regulations, 2014 (as amended), the objective of the impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
  - The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - The degree to which these impacts—
    - Can be reversed;
    - May cause irreplaceable loss of resources; and
    - Can be avoided, managed, or mitigated.
- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to–
  - Identify and motivate a preferred site, activity and technology alternative;
  - Identify suitable measures to avoid, manage or mitigate identified impacts; and
  - Identify residual risks that need to be managed and monitored.

3.2 DFFE WEB-BASED ENVIRONMENTAL SCREENING TOOL

DFFE has developed the National Web-based Environmental Screening Tool in order to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of regulation 16 (1)(v) of the EIA Regulations (2014, as amended). The *Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended* (GN 960 of July 2019) states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, published under Government Notice No. R982 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations, 2014 as of 04 October 2019.

The Screening Report generated by the National Web-based Environmental Screening Tool contains a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint as well as the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A screening report for the proposed Esizayo WEF Expansion Project was generated on 15 February 2022 and is attached as **Appendix H**. The Screening Report for the project identified various sensitivities for the site. The report also generated a list of specialist assessments that should form part of the BA based on the development type and the environmental sensitivity of the site. Assessment Protocols in the report provide minimum information

to be included in a specialist report to facilitate decision-making. **Table 3-1** below provides a summary of the sensitivities identified for the development footprint.

Table 3-1: Sensitivities identified in the screening report

THEME	VERY HIGH SENSITIVITY	HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVIY
Agricultural Theme			✓	
Animal Species Theme		✓		
Aquatic Biodiversity Theme	✓			
Archaeological and Cultural Heritage Theme		✓		
Avian Theme	✓			
Bats Theme		✓		
Civil Aviation Theme				✓
Defence Theme				✓
Flicker Theme	✓			
Landscape Theme	✓			
Palaeontology Theme	✓			
Noise Theme	✓			
Plant Species Theme			✓	
RFI Theme		✓		
Terrestrial Biodiversity Theme	✓			

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report:

- Agricultural Impact Assessment
- Landscape/Visual Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Aquatic Biodiversity Impact Assessment
- Avian Impact Assessment
- Civil Aviation Assessment
- RFI Assessment
- Geotechnical Assessment
- Plant Species Assessment
- Animal Species Assessment

3.2.1 MOTIVATION FOR SPECIALIST STUDIES

The report recognises that "it is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the footprint situation."

As summarised in **Table 3-1** above, the following specialist assessments have been undertaken for the project based on the environmental sensitivities identified by the Screening Report and are attached as **Appendix F**:

- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Assessment;
- Visual Impact Assessment;
- Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species);
- Avifauna Impact Assessment;
- Freshwater Impact Assessment;
- Visual Impact Assessment;
- Socio-economic Impact Assessment; and
- Traffic Assessment.

Three of the identified specialist studies have not been undertaken as part of the BA process for the proposed Esizayo WEF Expansion project. Motivation for the exclusion of these specialist studies is provided below.

GEOTECHNICAL ASSESSMENT

A detailed Geotechnical Assessment will not be undertaken as part of the BA Process as this will be undertaken during the design phase, in the event that the project is developed in the future. A desktop-based statement regarding the geotechnical environment has been included in **Section 6.1.4**.

CIVIL AVIATION

The Civil Aviation Authority will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought. An Application for the Approval of Obstacles will also be submitted to SACAA in the event that the project is developed in the future.

RFI ASSESSMENT

A Radio Frequency Interference (RFI) Study will not be undertaken. During the previous EIA and BA processes the SKA-SA confirmed that Esizayo WEF Expansion area is located within the Western Cape and will have no impact on the SKA. The Esizayo WEF Expansion area is located a significant distance from the SKA and so will have a very low impact risk of impact. SKA-SA will be engaged with as part of the Public Participation Process.

3.3 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with DFFE and subsequently completing the appropriate application form as well as the submission and registration of the application for EA with the DFFE. The pre-application meeting was held with DFFE on 01 April 2022 (approved meeting minutes are attached as **Appendix I**) and the application form was submitted to the DFFE on **06 May 2022**. A reference number will be included in the Final BAR following acknowledgment of receipt from the DFFE.

3.4 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports,

aerial imagery, and mapping. The specialist teams undertook site investigations between February 2021 and April 2022 to provide impact assessments for the proposed Esizayo WEF Expansion Project area.

3.5 IMPACT ASSESSMENT METHODOLOGY

3.5.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[6] presented in **Table 3-2**.

Table 3-2: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

[2] Impacts that arise directly from activities that form an integral part of the Project.
[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[4] Secondary or induced impacts caused by a change in the Project environment.
[5] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[6] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

3.5.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 3-1** below.

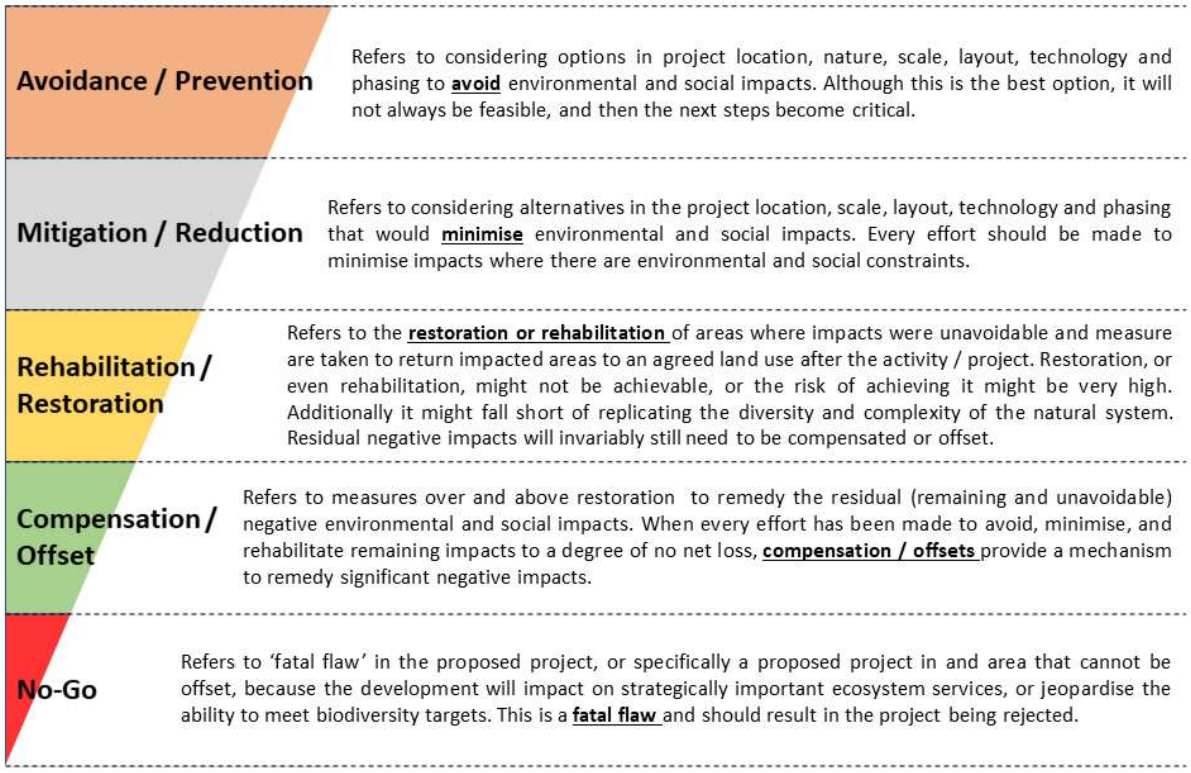


Figure 3-1: Mitigation Sequence/Hierarchy

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

3.6 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement (public participation) is a requirement of the BA process. It consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the BA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and

— To inform and provide the public with information and an understanding of the proposed project, issues, and solutions.

A Stakeholder Engagement Report (SER) has been included in **Appendix D** and will be updated in the final BAR, detailing the project's compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

3.6.1 STAKEHOLDER CONSULTATION

As part of the pre-application consultation meeting held with DFFE on 01 April 2022, the proposed plan for public participation was discussed. A public participation plan was subsequently submitted to DFFE, along with the meeting minutes, for approval on 11 April 2022. The meeting minutes and public participation plan were approved by DFFE on 21 April 2022. The approved meeting minutes and public participation plan are attached as **Appendix I.** Refer to the SER (**Appendix D**) for details of the approved public participation plan and stakeholder consultation undertaken to date.

3.6.2 PUBLIC REVIEW

The Draft BAR will be placed on public review for a period of 30 days from **6 May 2022** to**7 June 2022**, at the following public places:

— Majtiesfontein – Majtiesfontein Community Hall
— Laingsburg - Laingsburg Library; and
— WSP website (https://www.wsp.com/en-ZA/services/public-documents).

WSP will collate comments received during the public review phase and compile a Comments and Responses Report (CRR) that will be attached to the Final BAR as an Appendix.

3.7 ASSUMPTIONS AND LIMITATIONS

General assumptions and limitations relating to the BA process are listed below:

— The information provided by Esizayo, and the specialists is assumed to be accurate;
— WSP's assessment of the significance of impacts of the proposed project on the affected environment has been based on the assumption that the activities will be confined to those described in Section 4. If any substantial changes to the project description are made, impacts may need to be reassessed;
— Where detailed design information is not available, the precautionary principle (i.e., a conservative approach that overstates negative impacts and understates benefits) has been adopted;
— The competent authority would not require additional specialist input, as per the proposals made in this report, in order to make a decision regarding the application; and
— All information is assumed to be accurate and relevant at the time of writing this report.

Key assumptions and limitations relevant to the specialist assessments include:

Avifauna

This study made the basic assumption that the sources of information used are reliable and accurate. The following must be noted:

— The SABAP2 dataset is a comprehensive dataset which provides a reasonably accurate snapshot of the avifauna which could occur at the proposed WEF sites. For purposes of completeness, the list of species that could be encountered was supplemented with personal observations, general knowledge of the area, and the results of the pre-construction monitoring conducted over four seasons.

— Conclusions in this study are based on experience of these and similar species at wind farm developments in different parts of South Africa. However, bird behaviour can never be predicted with absolute certainty.

— To date, only one peer-reviewed scientific paper has been published on the impacts WEFs have on birds in South Africa (Perold et al., 2020). The precautionary principle was therefore applied throughout. The

World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "*in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation.*"

- According to the specifications received from the proponent, the 33kV medium-voltage lines which form part of the proposed WEFs will be buried, where practically feasible. It was therefore assumed that there could be 33kV overhead lines which could pose an electrocution risk to priority species.
- Priority species for wind development were identified from the updated list of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Retief et al., 2012).
- Information on the number of approved wind farms within a 35km radius around the proposed Esizayo Expansion WEF was sourced from a variety of sources, but mostly from documents in the public domain on the internet. Every effort was made to source accurate information, but it must be accepted that the information may not be up to date in all instances.

Biodiversity(including Bats)

The following assumptions and limitations are applicable for this assessment:

- The Project Area of Influence (PAOI) for the proposed development was the associated property area and external development footprint;
- A single field survey was undertaken during the dry season and therefore, many of the flora species present will not be recorded as they are dormant during this period;
- The bat baseline and impact sections of this report have been completed at a desktop level only. The results from the completed six-month monitoring study will be reported in May/June 2022, along with a detailed bat sensitivity map, and a re-assessment of potential impacts of the proposed Esizayo WEF on bats. The turbine curtailment and other mitigation measures will be revised if/where necessary;
- The biotic components considered for this assessment consisted of flora, herpetofauna and non-volant mammals. In addition, the Formicidae species assemblage was considered as an important component of this assessment as the group is a reliant indicator of habitat condition;
- Whilst every effort was made to cover as much of the site as possible, it is possible that some flora and fauna species that are present on site were not recorded during the field survey, especially secretive or rare species; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 5 m.

Freshwater Habitat Delineation

- The location and associated infrastructure were determined from information provided by Esizayo;
- Wetlands and/or riparian systems identified for delineation within the adjacent properties were based on a desktop review of available information and through a site inspection. This is reliant on various published data sources (e.g., aerial imagery and mapping) which have been assumed by WSP to be representative of site conditions;
- The wetland/riparian boundary comprises a gradually changing gradient of wetland/riparian indicators and varies both temporally and spatially; the wetland delineation thus occurs within a certain degree of tolerance;
- It should be recognised that there are several confounding effects on the interpretation of the historic and current extent, and functioning of the respective systems such as the historic and current industrial practices, roads, infilling, excavations/erosion, etc.;
- Wetland/riparian areas in close proximity to the proposed infrastructure was accurately delineated based on the initial desktop review and site observations. Owing to the extent of the Project site, the remaining

watercourses were delineated at a desktop level and broadly verified in the field to obtain an extent of the wetland/riparian areas;

- This report accounts for the potential impacts of the Project and associated activities only; and,
- The findings, results, observations, conclusions and recommendations given in this report are based on WSP's best scientific and professional knowledge as well as available information.

Heritage and Archaeology

- The archaeological field study was carried out at the surface only and any completely buried archaeological sites or material would thus not be readily located.
- As indicated above, the physical extent of the survey was constrained by the nature of the environment and very little access to the ridgelines where WTGs will be constructed was possible.
- Based on previous experience in the immediate vicinity of the proposed expansion area regarding the likely locations of heritage resources, however, ACO is confident that the degree of survey coverage has provided a good picture of the archaeology present within the expansion area.
- Although we believe that most of the relevant archaeological assessments and HIAs from the area have been located and reviewed, it is acknowledged that, particularly, recent (post-2010) heritage reports from the Western Cape do not generally appear on the SAHRIS database and that may mean that some recent reports may not have been identified for review.

Palaeontology

Since most fossils are buried beneath the surface, their nature and distribution cannot be directly assessed during field surveys of the development footprint. Palaeontological assessments therefore rely on extrapolating palaeontological sensitivities within the footprint from desktop data and field surveys of well-exposed sedimentary rocks, mostly from sites outside, and often well away from, the footprint itself. This approach assumes that the rock exposures seen are representative - in palaeontological terms - of the rock units (formations, members etc) that will be impacted by the proposed development.

In the case of the Esizayo Expansion study area near Laingsburg in the Western Cape, preservation of potentially fossiliferous bedrocks is favoured by the semi-arid climate and sparse vegetation. However, bedrock exposure is highly constrained by extensive superficial deposits, especially in areas of low relief, as well as pervasive Karoo bossieveld vegetation (Central Mountain Shale Renosterveld, Koedoesberg – Moordenaars Karoo, Tanqua Wash Riviere). Much of the study area is hilly or mountainous with few access roads, especially in rugged upland areas. However, sufficient bedrock exposures were examined during the course of the recent 4-day site visit to the WEF Expansion project area, backed-up by several recent, field-based PIA studies in this subregion of the Klein-Roggeveld, to assess the palaeontological heritage sensitivity of the main rock units represented within the study area. Confidence levels for this impact assessment are consequently rated as Medium.

Socio-economic

- Strategic importance of the project: The strategic importance of promoting renewable energy is supported by the national and provincial energy policies. The power line route is also located within Komsberg REDZ. However, this does not mean that site related issues can be ignored or overlooked.
- Fit with planning and policy requirements: Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported. However, the study recognises the strategic importance of solar energy and the technical, spatial and land use constraints required for solar energy facilities. The proposed expansion project is also located within the Komsberg REDZ. The area has therefore been identified as being suitable for the establishment renewable energy facilities and associated infrastructure.
- Demographic data: The information contained in some key policy and land use planning documents, such as Integrated Development Plans etc., may not contain data from Community Household Survey of 2016. However, this will not have a material impact on the findings of the study.

Soils and Agriculture Potential

- The geotechnical study has not yet been completed, so it is not yet known whether any large excavations and stabilized backfill will be required. The impact and mitigation assessment has been undertaken assuming that this is not the case.
- Site access was difficult owing to the terrain, a lack of access roads and inclement weather.
- The site could not be traversed such that an even grid matrix of classification points could be set up. As a result, some extrapolation of findings was necessary.

Traffic

The construction phase traffic was estimated based on the following assumptions:

- An estimated construction period of 24 months, with a variable number of staff required depending on the construction phase.
- An estimated maximum of 250 workers will be on-site every day during the peak construction period.
- Workers will not be accommodated on-site.
- 85% of the work force (unskilled and semi-skilled workers) will utilise public transport to site from neighbouring towns, most notably Laingsburg which is located approximately 90 km away.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 80% of Public Transport will be by bus, with a 65 person per bus occupancy.
- 20% of Public Transport will be by mini-bus, with a 16 person per vehicle occupancy.
- Staff will not utilise NMT to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and again depart during the AM and PM peaks.

The following assumptions were made to estimate the expected trip generation of the construction phase:

- It is assumed that masts will be manufactured of steel, and not hybrid masts with concrete sections.
- Each mast will consist of 5 x 30 m steel segments. One segment can be delivered per vehicle trip.
- One rotor blade can be transported on an abnormal size vehicle.
- The foundation per tower will be maximum 25 m diameter and 4m deep, which is approximately 1964m³ of concrete reinforced with 100 tons of steel.
- Ready-mix concrete is transported in 6m³ loads. Note, it is considered that the batching plant to be established on the adjacent site (Esizayo WEF approved) will be utilised. Therefore, the number of trips to deliver the aggregate for the concrete batching plant is expected to be less, as these aggregates can be transported in larger quantities per vehicle. The assumption that ready-mix concrete will be utilised therefore results in a higher, more conservative, trip generation for the material delivery.
- Steel is transported in 40 ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 24 months. It is assumed that deliveries will take place on 80% of all working days for a conservative trip generation estimate.
- A total of 15 679 delivery trips (in & out total) will be required during the 24 months of construction, which is approximately 39 trips a day (In & Out total).
- The delivery of materials during the AM and PM peak hours will therefore be low, as trucks will arrive and depart throughout the day. If a conservative maximum 20% of the daily trips are generated during the AM and PM peaks, a total of less than 8 trips per peak hour is expected, which is negligible.

Visual

- This assessment was undertaken during the planning stage of the project and is based on information available at that time.

Noise

- The turbine specifications provided are assumed to be representative of what will be installed in reality;
- The turbine locations provided are assumed to be an accurate representation of where these will be located in reality; and
- Identification of sensitive receptors is based on a desktop assessment and it is assumed that all key receptors have been included

It is the view of WSP that these assumptions and limitations do not compromise the overall findings of the report as WSP verified and reviewed the information provided by Esizayo and the specialists.

4 PROJECT DESCRIPTION

This section provides a description of the location of the project area and the site location alternatives considered for the project. The descriptions encompass the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management. This section also considers the need and desirability of the project in accordance with Appendix 1 of GNR 326.

4.1 LOCATION OF THE PROPOSED PROJECT

The proposed Project is located in the Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province. The Project area is located approximately 30km Northeast of Laingsburg in the Western Cape (**Figure 4-1** and **Figure 4-2**).

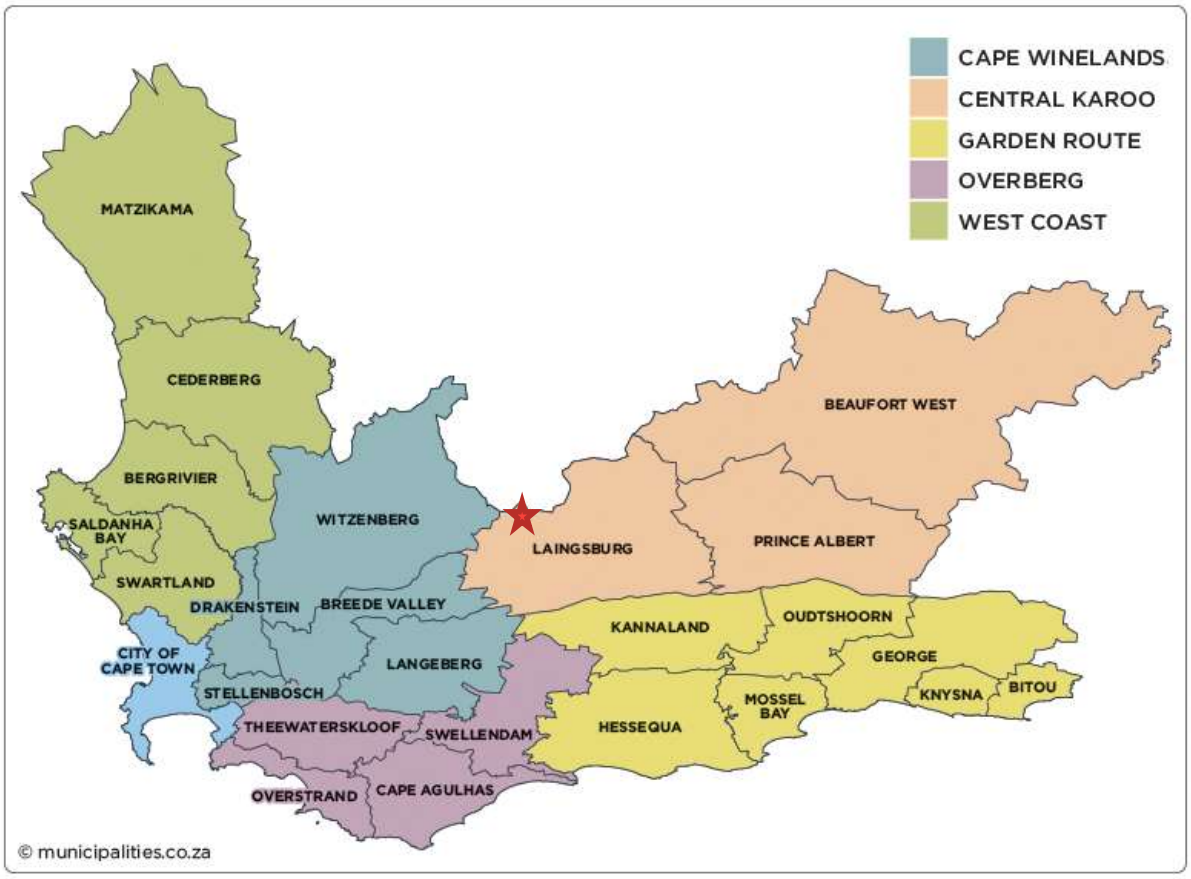


Figure 4-1: The study area (red star) in relation to the Western Cape District and Local Municipalities

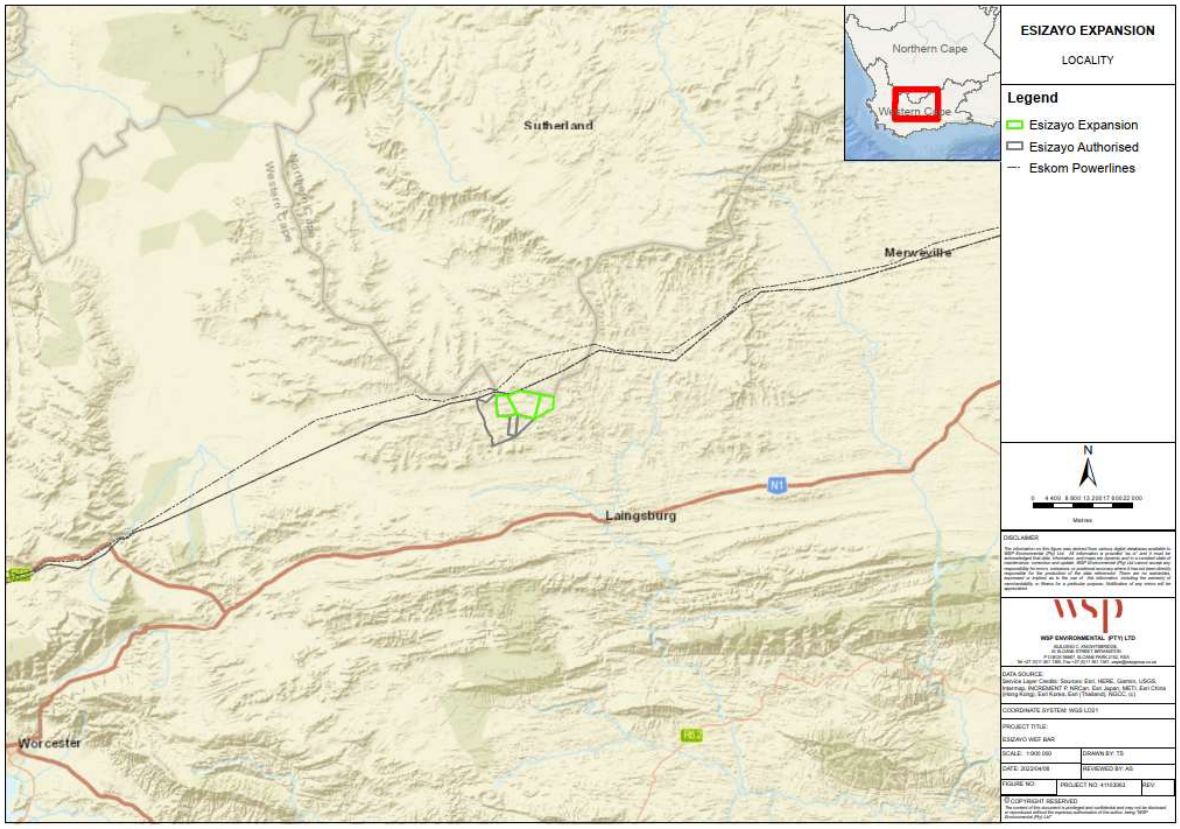


Figure 4-2: Locality of the Proposed Esizayo WEF Expansion Project

The proposed Esizayo WEF Expansion is proposed to be located over three properties with two different landowners (**Table 4-1**).

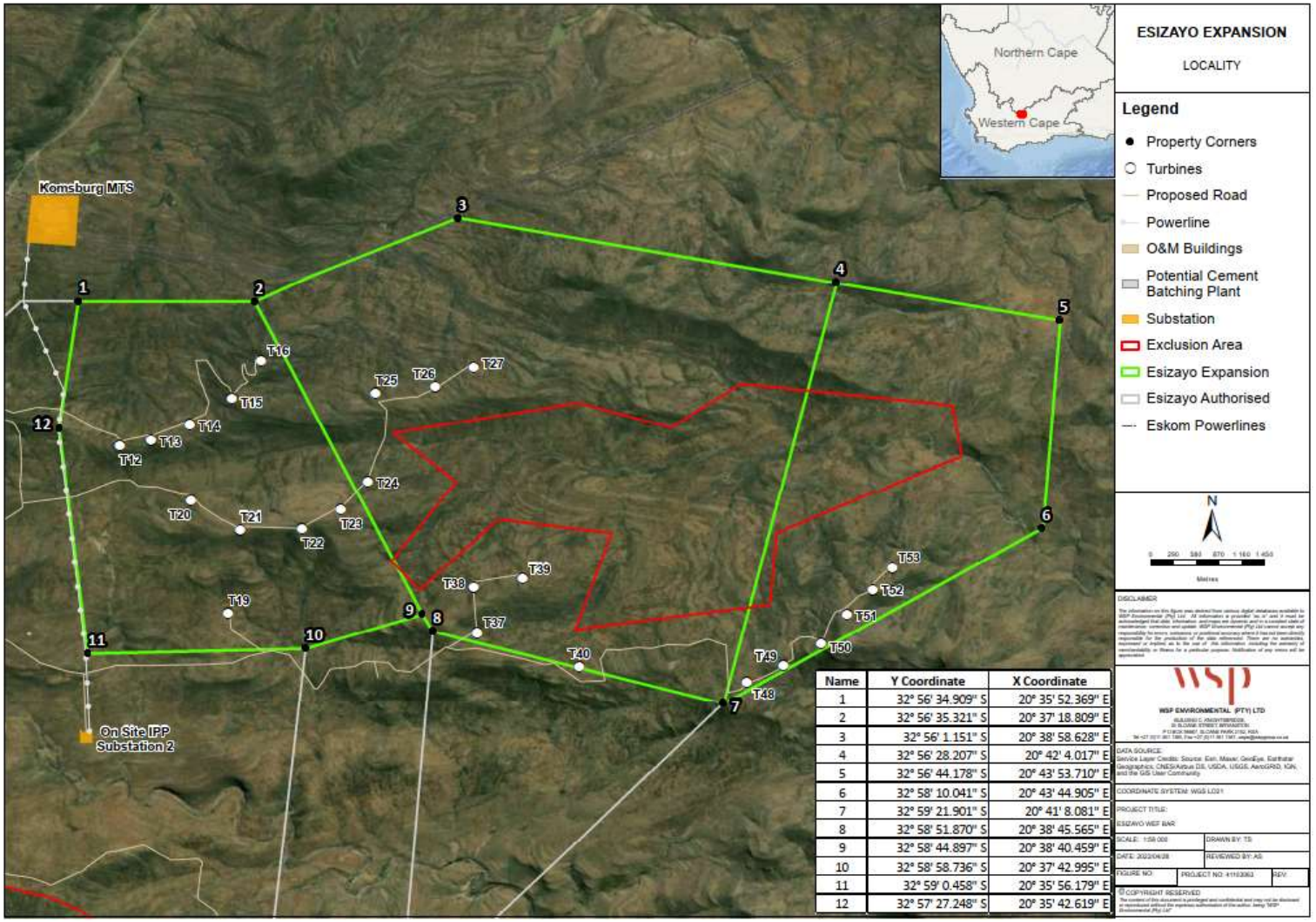
Table 4-1: Farm portions on which the proposed Esizayo WEF Expansion is located

FARM NAME & NUMBER	OWNER	21 DIGIT SG CODE	MUNICIPALITY / PROVINCE	PROVINCE	FARM SIZE
Portion 1 of Farm Leeuwenfontein 71	Le Roux Trust	C04300000000007100001	Laingsburg Local Municipality/ Karoo Central District Municipality/ Western Cape	Western Cape	1 310ha
Remainder of Farm Leeuwenfontein 71	Le Roux Trust	C04300000000007100000	Laingsburg Local Municipality/ Karoo Central District Municipality/ Western Cape	Western Cape	3 082ha
Portion 2 of Farm Aanstoot Farm 72	Standvastigheid Familie Trust	C04300000000007200002	Laingsburg Local Municipality/ Karoo Central District Municipality/ Western Cape	Western Cape	1562ha
Total Area					**5 954ha**

The approximate co-ordinates of the boundary points of the project site for the proposed Esizayo WEF Expansion are detailed in **Table 4-2**. A map corresponding to the co-ordinate points are indicated in **Figure 4-3**.

Table 4-2: Co-ordinate Points along the boundary of the proposed Esizayo WEF Expansion

POINT	CO-ORDINATES	
Portion 2 of Farm Aanstoot Farm 72 Corner Points		
CP1	32° 56' 34.909" S	20° 35' 52.369" E
CP2	32° 56' 35.321" S	20° 37' 18.809" E
CP9	32° 58' 44.897" S	20° 38' 40.459" E
CP10	32° 58' 58.736" S	20° 37' 42.995" E
CP11	32° 59' 0.458" S	20° 35' 56.179" E
CP12	32° 57' 27.248" S	20° 35' 42.619" E
Portion 1 of Farm Leeuwenfontein 71 Corner Points		
CP4	32° 56' 28.207" S	20° 42' 4.017" E
CP5	32° 56' 44.178" S	20° 43' 53.710" E
CP6	32° 58' 10.041" S	20° 43' 44.905" E
CP7	32° 59' 21.901" S	20° 41' 8.081" E
Remainder of Farm Leeuwenfontein 71		
CP2	32° 56' 35.321" S	20° 37' 18.809" E
CP3	32° 56' 1.151" S	20° 38' 58.628" E
CP4	32° 56' 28.207" S	20° 42' 4.017" E
CP7	32° 59' 21.901" S	20° 41' 8.081" E
CP8	32° 58' 51.870" S	20° 38' 45.565" E
CP9	32° 58' 44.897" S	20° 38' 40.459" E



Name	Y Coordinate	X Coordinate
1	32° 56' 34.909" S	20° 35' 52.369" E
2	32° 56' 35.321" S	20° 37' 18.809" E
3	32° 56' 1.151" S	20° 38' 58.628" E
4	32° 56' 28.207" S	20° 42' 4.017" E
5	32° 56' 44.178" S	20° 43' 53.710" E
6	32° 58' 10.041" S	20° 43' 44.905" E
7	32° 59' 21.901" S	20° 41' 8.081" E
8	32° 58' 51.870" S	20° 38' 45.565" E
9	32° 58' 44.897" S	20° 38' 40.459" E
10	32° 58' 58.736" S	20° 37' 42.995" E
11	32° 59' 0.458" S	20° 35' 56.179" E
12	32° 57' 27.248" S	20° 35' 42.619" E

Figure 4-3: Esizayo WEF Expansion Project Layout with Boundary Co-ordinate Points

4.2 PROJECT INFRASTRUCTURE

The proposed project is for the construction and operation of a wind energy facility that can produce 200 MW of power.

The proposed Esizayo WEF Expansion project entails expanding the existing Esizayo WEF extent through the addition of three (3) land parcels with a total development infrastructure footprint of approximately 200 ha (**Figure 4-2**). The proposed development will incorporate the following infrastructure, to enable the facility to supply a contracted capacity of up to 200 MW:

- Up to 23 wind turbines. Each turbine with a foundation of up to 25 m in diameter and up to 4 m in depth, compacted hard standing areas of up to 4.5 ha each;
- Internal roads traversing a length of 30 km with a width up to 9 m;
- 33 kV underground cables or overhead powerlines; and
- Fence around the project development area.

A technical summary of the facility and its associated infrastructure is included in **Table 4-3.**

Table 4-3: Details of the proposed Esizayo WEF Expansion and associated infrastructure

TECHNICAL DETAILS OF THE PROPOSED ESIZAYO WIND ENERGY EXPANSION PROJECT

Location of the Site	Approximately 30 km northeast of Laingsburg
Total Area of the Site	5 954 ha
Size Of Buildable Area i.e., Project Infrastructure Footprint (Only Referred Layout, Inclusive of All Associated Infrastructure)	Up to 200 ha (including turbine hard standings, roads and powerlines)
Area Occupied By Each Turbine	Each turbine with a foundation of up to 25 m in diameter and up to 4 m in depth, compacted hard standing areas of up to 4.5 ha each
Farm Names	Portion 2 of Farm Aanstoot Farm 72 (C04300000000007200002) Portion 1 of Farm Leeuwenfontein 71 (C04300000000007100001) Remainder of Farm Leeuwenfontein 71 (C04300000000007100000)
Export Capacity	Up to 200 MW
Proposed Technology	Wind turbines
Number Of Turbines	Up to 23 wind turbines
Turbine Generating Capacity	Up to 10 MW
Hub Height From Ground Level	Up to 150 m
Rotor Diameter	Up to 200 m

TECHNICAL DETAILS OF THE PROPOSED ESIZAYO WIND ENERGY EXPANSION PROJECT

Width Of Internal Roads	Up to 9 m (vertical curves will have a radii up to 55m)
Length Of Internal Roads	30 km
Area Of Preferred Operations and Maintenance Building	The expansion project will use the authorised Esizayo project's O&M building
Footprint Of Operations and Maintenance Building(S)	The expansion project will use the authorised Esizayo project's O&M building
Area Of Preferred Construction Laydown Areas	The expansion project will use the authorised Esizayo project's construction laydown area
Cement Batching Plant	The expansion project will use the authorised Esizayo project's cement batching plant
Power Lines	33 kV underground cables or overhead powerlines linking groups of wind turbines to an onsite 132 kV substation. The 132kV substation and grid connection is included in a separate application and not included in the expansion project scope of work.

4.3 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

The typical steps involved in the construction and operation of a wind energy facility is summarised below:

- Planning Phase
  - Step 1: Surveying of the development area and negotiation with affected landowners; and
  - Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities.
- Construction Phase
  - Step 3: Vegetation clearing and construction of access roads/tracks (where required);
  - Step 4: Construction of turbine tower structure foundations;
  - Step 5: Assembly and erection of infrastructure on site;
  - Step 6: Stringing of conductors; and
  - Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.
- Operation Phase
  - Step 7: Continued maintenance during operation.

4.3.1 CONSTRUCTION PHASE

The main activities associated with the construction phase of the wind energy project will include the following:

CONSTRUCTION SCHEDULE

Construction of the WEF is anticipated to take up to 24 months.

ESTABLISHMENT OF AN ACCESS ROAD TO THE SITE

It is recommended that the access road to the Komsberg substation and Kareedoring Kraal off the R354 be utilised for construction and operational vehicle access. This route traverses the middle portion of the site in a roughly north-west to south-east direction.

Alternatively, the existing access road to the farm Aanstoot off the R354 could be utilised during construction and the future operational phase of the facility. Refer to **Figure 4-2** for the access roads.

If an alternate access off the Provincial Road network such as the R354 is required for the construction and/or operational phases, the access location/s will require assessment in terms of sight distance, topography, access geometry and overall safety and suitability. This assessment will require a formal access application and approval from the Western Cape Department of Roads and Public Works.

The location of the temporary and/or permanent roads that will be constructed on-site to access each of the turbine sites and support buildings has not been determined. It is however recommended that these internal roads take access off the existing farmstead access roads where possible.

ESTABLISHMENT OF INTERNAL ROADS

Internal road access will be constructed onsite. These roads will be up to 9 m in width (vertical curves will have a radii up to 55m). The length of the internal road network is approximately 30 km.

SITE PREPARATION

Site preparation includes the clearance of vegetation and any bulk earthworks (including blasting if required) within the footprint of each construction area that may be required in terms of the facility design.

TRANSPORT OF COMPONENTS AND EQUIPMENT TO SITE

All construction material (i.e., masts, blades and associated infrastructure), machinery and equipment (i.e., graders, excavators, trucks, cement mixers etc.) will be transported to site utilising the national, regional and local road network. Large Components (such as substation transformers and tower sections) may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989). In such cases a permit may be required for the transportation of these loads on public roads.

ESTABLISHMENT OF A LAYDOWN AREA ON SITE

Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. The expansion project will use the authorised Esizayo project's construction laydown area. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.

CONSTRUCT FOUNDATION

Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of 4 m, depending on the local geology. Concrete will be prepared at the authorised Esizayo project's cement batching plant.

CONSTRUCTION OF THE TURBINE

A large lifting crane will be brought onto site to lift each of the tower parts into place (**Figure 4-4** and **Figure 4-5**).

Figure 4-4: Construction of the Turbine – Preparing to lift the Rotor (Source: BioTherm Energy, 2016)

Figure 4-5: Construction of the Turbine – Lifting Equipment (i.e., Crane) (Source: BioTherm Energy, 2016)

CONSTRUCT IPP SUBSTATION AND INVERTORS

Invertors will be installed to facilitate the connection between the wind turbines and the Eskom Grid. The turbines will be connected to the substation via underground or overhead cabling. The substation will be constructed with a maximum footprint of approximately 150 m x 150 m. The 132kV substation and grid connection is included in a separate application and not included in the expansion project's scope of work.

ESTABLISHMENT OF ANCILLARY INFRASTRUCTURE

The expansion project will use the authorised Esizayo project's Operations and Maintenance building, storage areas, office and a temporary laydown area for contractor's equipment.

UNDERTAKE SITE REHABILITATION

The site will be rehabilitated once the construction phase is complete, and all construction equipment and machinery have been removed from site.

4.3.2 OPERATIONAL PHASE

The proposed WEF Expansion is anticipated to have a minimum life of 20 years. The facility will operate 7 days a week. While the project is self-sufficient, maintenance and monitoring activities will be required. Potable water requirements for permanent staff will be limited and provided by bottled water.

During the operational phase there will be little to no Project-related movement along the servitude as the only activities are limited to maintaining the servitude (including maintenance of access roads and cutting back or pruning of vegetation to ensure that vegetation does not affect the WEF), inspection of the WEF infrastructure and repairs when required. Limited impact is expected during operation since there will not be any intrusive work done outside of maintenance in the event that major damage occurs to site infrastructure.

Operation of the WEF will involve the following activities, discussed below.

SERVITUDE MANAGEMENT AND ACCESS ROAD MAINTENANCE

Servitude and access road maintenance is aimed at eliminating hazards and facilitating continued access to the WEF. The objective is to prevent all forms of potential interruption of power supply due to overly tall vegetation/climbing plants or establishment of illegal structures within the right servitude. It is also to facilitate ease of access for maintenance activities on the WEF. During the operational phase of the project, the servitude will be maintained to ensure that the functions optimally and does not compromise the safety of persons within the vicinity of the WEF.

WIND ENERGY FACILITY MAINTENANCE AND OPERATIONS

Esizayo will develop comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for the WEF. The maintenance activities will include:

- Esizayo's Maintenance Team will carry out periodic physical examination of the WEF and its safety, security and integrity.
- Defects that are identified will be reported for repair. Such defects may include defective conductors, flashed over insulators, defective dampers, vandalised components, amongst others.
- Maintenance / repairs will then be undertaken.

4.3.3 DECOMMISSIONING PHASE

Following the initial 20-year operational period of the wind facility, the continued economic viability will be investigated. If the facility is still deemed viable, the life of the facility will be extended. The facility will only be decommissioned once it is no longer economically viable. If a decision is made to completely decommission the facility, this will be subject to a separate authorisation and impact assessment process, all the components will be disassembled, reused and recycled or disposed. The site would be returned to its current use i.e., agriculture (Grazing).

4.4 NEED AND DESIRABILITY OF THE PROJECT

The DEA&DP Guideline (2013) states that the essential aim of need and desirability is to determine the suitability (i.e., is the activity proposed in the right location for the suggested land-use/activity) and timing (i.e., is it the right time to develop a given activity) of the development. Therefore, need and desirability addresses whether the development is being proposed at the right time and in the right place. Similarly, the 'Best Practicable Environmental Option' (BPEO) as defined in NEMA is "*the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*."

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh highest coal producer in the world, with approximately 77% of the country's electricity generated from coal. This large dependence on coal and its use has also resulted in a variety of negative impacts on the environment, including the contribution to climate change. South Africa is also the highest emitter of greenhouse gases in Africa; attributed to the country's energy-intensive economy that largely relies on coal-based electricity generation.

Renewable energy development is regarded as an important contribution to meeting international and national targets of reducing reliance on fossil fuels, such as coal, which contribute towards greenhouse gas emissions and resultant climate change. The need and desirability of proposed Esizayo WEF Expansion has been considered from an international, national, and regional perspective.

4.4.1 INTERNATIONAL PERSPECTIVE

The proposed project will align with internationally recognised and adopted agreements, protocols, and conventions. This includes the Kyoto Protocol (1997) which calls for countries internationally to reduce their greenhouse gas emissions through cutting down on their reliance on fossil fuels and investing in renewable energy technologies for electricity generation. The proposed WEF will therefore add capacity to the energy sector and generate electricity without greenhouse gas emissions and meet international requirements in this regard.

South Africa is also signatory to the United Nations' Development Programmes' (UNDP) Sustainable Development Goals (SDGs), particularly SGD 7 relating to affordable and clean energy. The proposed WEF qualifies as a clean technology that will generate 200MW of affordable energy to contribute to South Africa's energy mix.

The project will also greatly contribute to the countries' efforts to reduce their carbon emissions and play their role as part of the Paris Climate Accord. The Paris Agreement is a legally binding international treaty signed by 196 countries at the COP 21 in Paris, on the 12th of December 2015 to combat climate change. The goal of the Paris Accord is to limit global warming to well below 2 degrees Celsius, compared to industrial levels to avoid catastrophic natural disasters which are driven by the global temperature increase. Therefore, to achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate-neutral world by 2050. This project will aid in the efforts towards a just energy transition in accordance to recently signed Political Declaration between SA, USA, UK, EU, Ireland etc.

The authorization of the Project will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the Greenhouse gases concentrations in the atmosphere.

4.4.2 NATIONAL PERSPECTIVE

The South African Government, through the IRP, has set a target to secure 17 800 MW of renewable energy by 2030. This is an effort to diversify the country's energy mix in response to the growing electricity demand and promote access to clean sources of energy.

The National Development Plan (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030. The NDP also outlines the need to increase electricity production by 2030, with 20 000 MW of electricity capacity generated from renewable sources to move to less carbon-intensive electricity production. The Plan also envisages that South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.

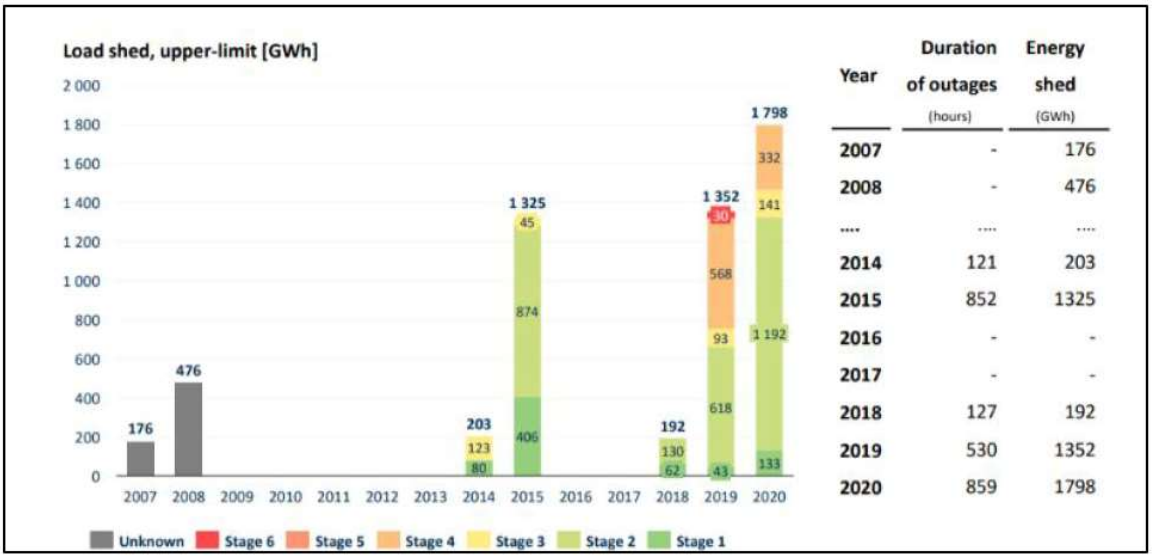
The authorisation of the Esizayo WEF Expansion will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the greenhouse gases concentrations in the atmosphere.

The proposed Esizayo WEF, which includes the authorised WEF as well as this proposed expansion, will pave the way for the Just Energy Transition (JET)[7] in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The proposed project aims towards the aforementioned national energy targets of diversification of energy supply and the promotion of clean energy. Wind and solar energy developments contribute to reduced emissions and subsequently climate change whilst promoting industrial development and job creation.

The proposed Esizayo WEF Expansion will also aid in overcoming the power shortages that are currently faced in the country. In 2020, South Africa witnessed its longest recorded hours of load shedding, with the power being off for 859 hours of the year as shown in **Figure 4-6**. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPP and lifting the independent power generation threshold to 100MW, but it is still expected that the country will undergo more load shedding.

Over the years the construction of Wind facilities has become cheaper, and less time-consuming. Thus, acting as a faster and more efficient method of meeting the ever-growing demand for electricity in the country.

In addition, the Council for Scientific and Industrial Research (CSIR) reported that renewable energy assisted in relieving pressure on the constrained South African power system during load shedding in the first quarter of 2019. This indicates that renewable energy is a key factor in ensuring that the country does not face further load shedding in the future.



Year	Duration of outages (hours)	Energy shed (GWh)
2007	-	176
2008	-	476
....	....	....
2014	121	203
2015	852	1325
2016	-	-
2017	-	-
2018	127	192
2019	530	1352
2020	859	1798

Figure 4-6: Load shedding hours over the years in South Africa

4.4.3 REGIONAL AND LOCAL PERSPECTIVE

JUST ENERGY TRANSITION

Coal power stations and the coal mining industry play a vital component in the economic and social components of the local Mpumalanga economy. Shifting to a low carbon economy will thus need to offset or exceed the benefits being realized by fossil fuels in the province. Thus, a key factor to ensuring the success of the Just Energy Transition is not only to focus on the transition from fossil fuels to renewable energy resources but to simultaneously ensure the Just Transition of jobs and skills.

[7] The Just Transition is described as the transition towards a low-carbon and climate-resilient economy that maximizes the benefits of climate action while simultaneously improving the welfare of the workers and their communities.

As various career opportunities are presented by the wind industry, and these are divided into four pillars that are aligned with the value chain. These four pillars are project development, component manufacturing, construction, and operation & maintenance as shown in **Figure 4-7**.

Figure 4-7 shows that the wind industry will create job opportunities throughout the supply chain. The wind industry will contribute to the Just transition in South Africa to ensure that there are no job losses but rather job transfers and skill exchange.

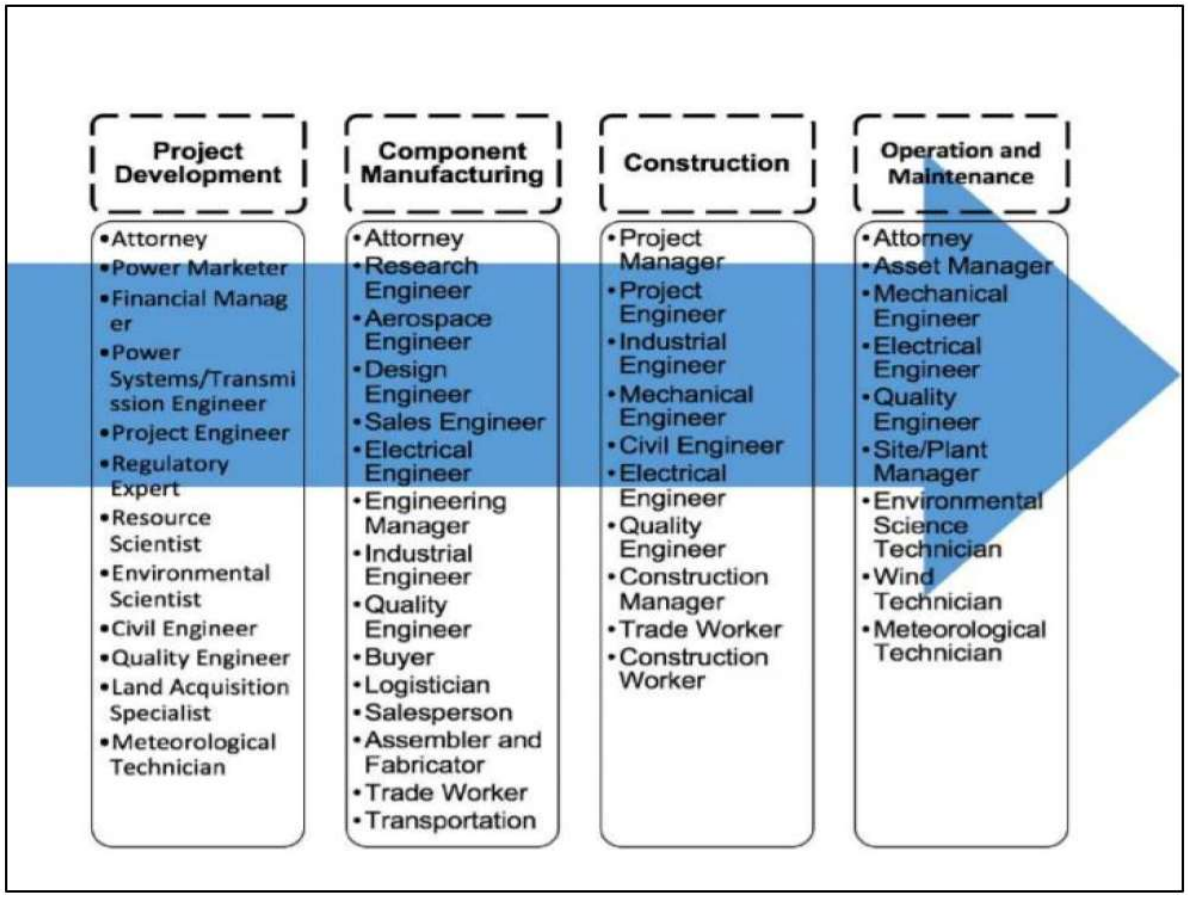


Figure 4-7: Career Opportunities presented by the Wind Industry (Source: https://www.res4africa.org/wp-content/uploads/2020/09/RES4Africa-Foundation-A-Just-Energy-Transition-in-South-Africa.pdf)

SITE SUITABILITY

The proposed project is to be developed approximately 30km Northeast of Laingsburg in the Western Cape.

The project area was identified through a pre-feasibility desktop analysis on the estimation of the wind energy resource. This region of the Western Cape has some of the highest wind resource potentials, receiving an annual mean wind resource of approximately 8 m/s, making the site suitable for the development of a wind farm. This high resource ensures the best value for money is gained for the economy of South Africa.

Whilst there are many wind projects already authorised by the DFFE, many stand a little chance of ever being built due to poor wind regime to be economically competitive and the site being in an area with unfeasible grid connections. Due to the distance to grid and high wind resources the project site is considered to be highly desirable from a development perspective and is considered by BioTherm to stand an excellent chance of success in the imminent bidding round (BW6).

Within the Western Cape region, the reasons for the selection of the specific site by BioTherm is based on the following site selection process summary:

- Grid connection suitability is a key criterion. Long connection lines have increased environmental impacts as well as add increased costs to the project development. This project site has good grid connection potential as the project will connect to the existing Komsberg MTS Substation located approximately 2 km away from the site, thereby minimising the need for an extensive grid network upgrade or long powerline.
- The proposed Esizayo WEF Expansion is located within the Komsberg REDZ and Central Strategic Transmission Corridor as per GN 114 and GN 113 of 2018. Strategic Transmission Corridors support areas where long-term electricity grid infrastructure will be developed **Figure 4-8** below shows the location of the five corridors and the approximate location of the Esizayo WEF Expansion within the Central Corridor.
- The project site has a rolling hill topography which is suitable for the development of a wind project.
- The land on which the WEF Expansion will be constructed is all privately owned agricultural land, which is zoned for agriculture. It is not necessary for each of the properties to be rezoned as the land will continue to be used for agriculture. No physical or economic displacement will be required along the proposed route.
- The project site can be accessed easily via the tarred R354 national road. Upgrades of the regional gravel road will be done by the current preferred bidder projects to allow for direct access to site. Esizayo is located directly adjacent to the R354.

This site was selected based on the above criteria ahead of other regional farms due to the cumulative assessment of all criteria. This internal process ensured that the best practical / technically suitable environmental site option was selected.

Furthermore, negative environmental impacts associated with the activity will be mitigated to acceptable levels in accordance with this EMPr (**Appendix G**).

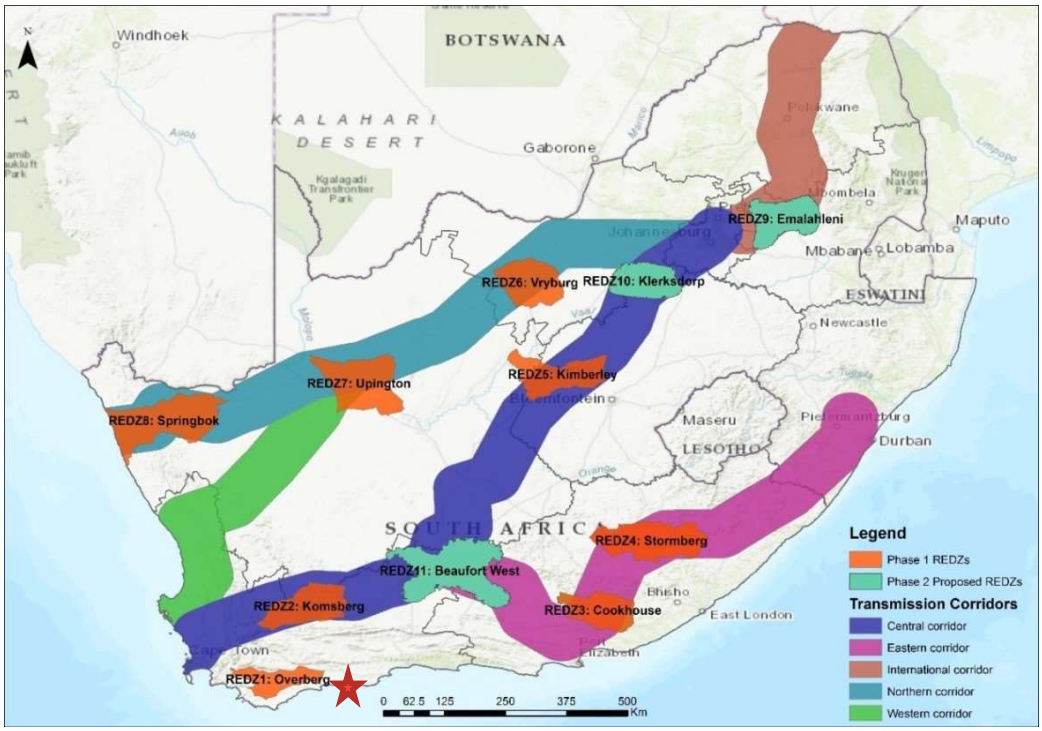


Figure 4-8: Strategic Transmission Corridors and REDZ (GN 113 and 114 of 2018) (red star is approximate location of Esizayo WEF Expansion Project

5 PROJECT ALTERNATIVES

In terms of the EIA Regulations, feasible alternatives are required to be considered. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic, and technical factors. A key challenge of the BA Process is the consideration of alternatives. Most guidelines use terms such as 'reasonable', 'practicable', 'feasible' or 'viable' to define the range of alternatives that should be considered.

Effectively there are two types of alternatives:

- Incrementally different (modifications) alternatives to the project; and
- Fundamentally (totally) different alternatives to the project.

"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 –

a) the property on which or location where it is proposed to undertake the activity;
b) the type of activity to be undertaken;
c) the design or layout of the activity;
d) the technology to be used in the activity;
e) the operational aspects of the activity; and
f) the option of not implementing the activity (i.e., no-go).

The relevant alternatives to the proposed Project are discussed below.

5.1 ACTIVITY ALTERNATIVE

Only one activity has been assessed (i.e., a wind energy facility). Alternative activities for the current Project are not reasonable or feasible as the purpose of this Esizayo WEF Expansion is to transmit the electrical energy generated to the existing Komsberg substation for distribution via the national electrical grid network.

5.2 TECHNOLOGY ALTERNATIVES

The technology identified for this project is wind energy. Due to the fact that the study area has very steep topography it is not suitable for solar energy such as photovoltaic or concentrating solar power projects. The major advantages and disadvantages of wind technology are provided in **Table 5-1.**

Table 5-1: Advantages and Disadvantages of Wind Technology

ADVANTAGES	DISADVANTAGES
— The wind is a renewable and zero-rated cost resource and with modern technology it can be captured efficiently. — Once the wind turbine is built the energy it produces does not emit greenhouse gases or other pollutants. — Although wind turbines can be very tall each takes up only a small plot of land. This means that the land below can still be used. This is advantageous in agricultural areas as farming can still continue. — Many people find wind farms an interesting feature of the landscape.	— The strength of the wind is not constant, and it varies from zero to storm force. This means that wind turbines do not produce the same amount of electricity all the time. There will be times when they produce no electricity at all. — Wind turbines generate noise which can increase ambient noise levels with potential to cause human and ecological disturbances. — Many people see large wind turbines as unsightly structures and not pleasant or interesting to look at. — It's widely reported that wind turbines pose a threat to wildlife, primarily birds and bats.

5.3 LOCATION ALTERNATIVES

No alternative location for the proposed Project is deemed viable as the three additional farm portions which will be utilised for the proposed expansion are located adjacent to the authorised Esizayo WEF.

5.4 LAYOUT ALTERNATIVES

A conceptual layout of the turbines on the landscape has been developed for the Esizayo WEF expansion and is included in **Figure 4-3**. The layout indicates 23 turbine positions and associated main WEF components. The layout is likely to be updated and refined as the project engineering progresses, as well depending on technical inputs and micro-siting required prior to construction.

The developed layout of the Esizayo WEF expansion layout is not yet final.

5.5 NO-GO ALTERNATIVE

The no-go option will mean the status quo remains. Both the potential positive and negative impacts from the proposed WEF Expansion will not occur.

South Africa currently relies almost completely on fossil fuels as a primary energy source (approximately 90%) with coal providing 75% of the fossil fuel based energy supply. Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is the main greenhouse gas that has been linked to climate change.

An emphasis has therefore been placed on securing South Africa's future power supply through the diversification of power generation sources. Furthermore, South Africa would have to invest in a power generation mix, and not solely rely on coal-fired power generation, to honour its commitment made under the Copenhagen Accord and to mitigate climate change challenges.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports in the country.

The no-go option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with renewable energy given that energy security benefits associated with the proposed Esizayo WEF Expansion are dependent upon the WEF being able to connect to the national grid via the establishment of grid connection infrastructure. Considering South Africa’s current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant socio-economic cost.

The no-go option is a feasible option; however, this would prevent Esizayo from contributing to the significant environmental, social and economic benefits associated with the development of the renewables sector (see need and justification of the proposed project in Section 4.4 above). Accordingly, the no-go option is not the preferred option.

6 BASELINE ENVIRONMENT

The following section presents an overview of the biophysical and socio-economic environment in which the proposed Project is located. It is important to gain an understanding of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project (i.e., the current, or status quo, environment) against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The area has previously been studied to some extent and is recorded in various sources. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed Project.

The following characteristics of the receiving environment for the proposed Project area are described in **Table 6-1** below.

Table 6-1: Characteristics of the receiving environment

RECEIVING ENVIRONMENT	CHARACTERISTICS
Terrestrial Biophysical	— Climate — Air Quality — Topography and Land Use — Geology and Soils (including Geotechnical) — Groundwater — Surface Water (Hydrology) — Ecologically Important Landscape Features — Vegetation — Fauna — Bats — Avifauna — Site Ecological Importance — Protected Areas
Social and Economic	— Socio-Economic — Heritage — Palaeontology — Landscape and Visual — Noise — Traffic

6.1 BIOPHYSICAL ENVIRONMENT

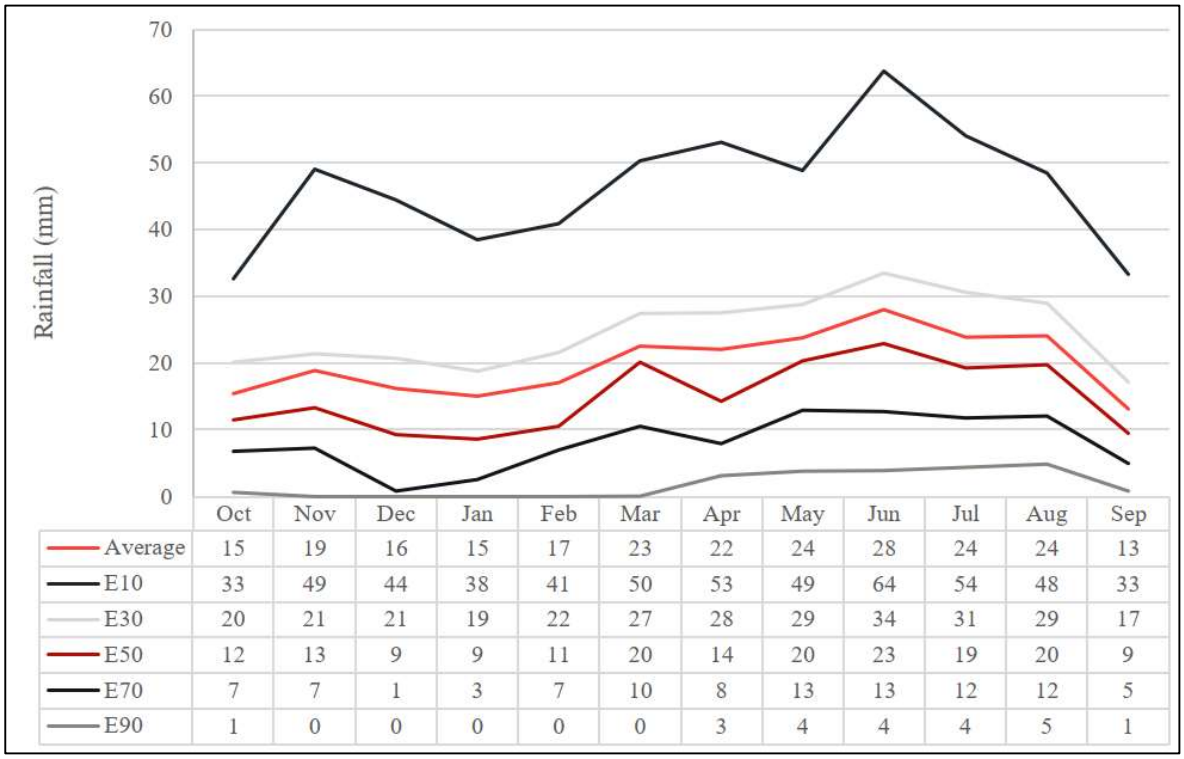
6.1.1 CLIMATE

*The following is extracted from the Hydrological Assessment compiled by WSP and included as **Appendix F7.***

The climate of the region is arid to semi-arid. Rainfall is low and occurs throughout the year but predominantly in the winter months between March and August. Mean annual precipitation is approximately 290 mm, ranging from 180 –

410 mm rainfall per year. The site falls within rainfall zone J1A associated with quaternary J11D, with an MAP of 240 mm. The monthly rainfall distribution is represented in **Figure 6-1**. The 'E' values show the probability of non-exceedance, so highlight the likelihood that the specific rainfall event will not be exceeded.

The region experiences dry hot summers, and the warmest month of the year is February which averages 23.4° C. The lowest average temperatures in the year occur in July, averaging approximately 9.3° C. The region experiences steady, strong winds between December and April; however, the winds calm between the months of June and October.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average	15	19	16	15	17	23	22	24	28	24	24	13
E10	33	49	44	38	41	50	53	49	64	54	48	33
E30	20	21	21	19	22	27	28	29	34	31	29	17
E50	12	13	9	9	11	20	14	20	23	19	20	9
E70	7	7	1	3	7	10	8	13	13	12	12	5
E90	1	0	0	0	0	0	3	4	4	4	5	1

Figure 6-1: Monthly Rainfall for Quaternary J1A (WR2012, 2021)

Laingsburg experiences steady strong winds between December to April however the winds calm between the months of June and October. **Figure 6-2** shows the number of days within each month when the wind can be expected to reach speeds varying from 1 to 61km/h. **Figure 6-3** represents the wind rose for the Laingsburg area which depicts the direction from which the wind originates.

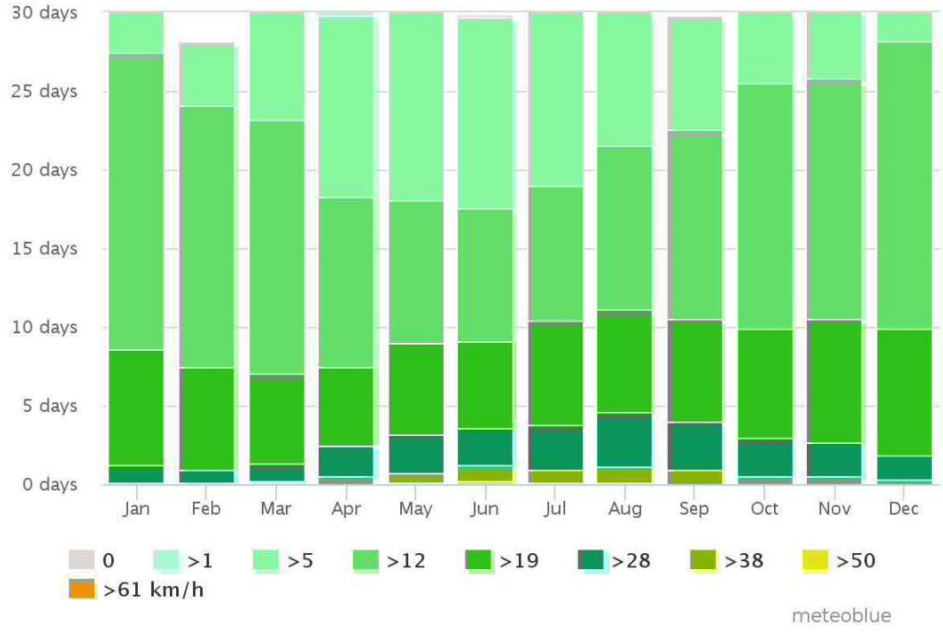


Figure 6-2: Annual Wind Speed (km/h) for Laingsburg

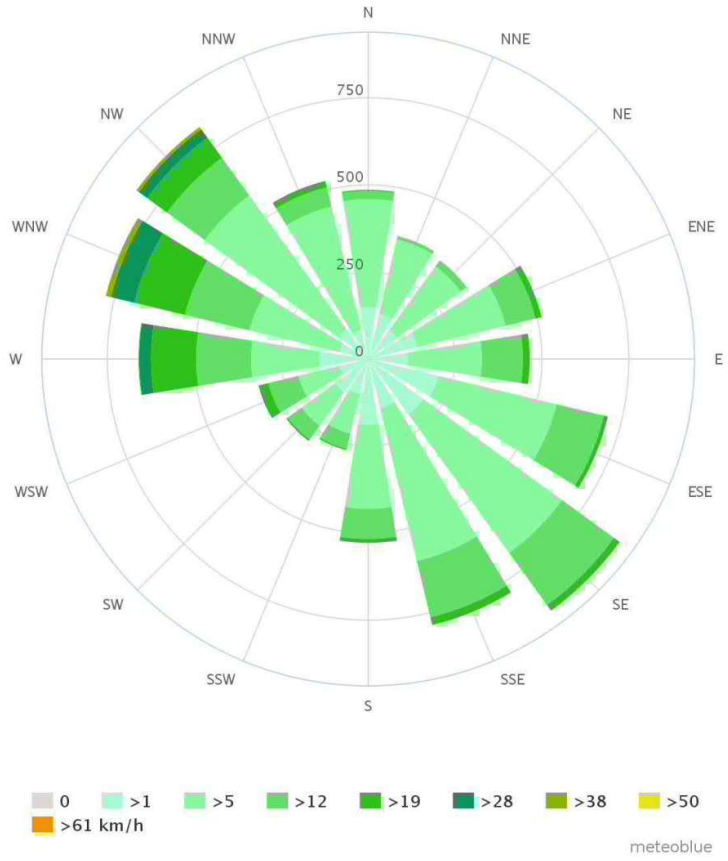


Figure 6-3: Wind Rose for Laingsburg (average annual winds)

6.1.2 AIR QUALITY

According to the revised Central Karoo District Municipality Air Quality Management Plan (2015/2016), there are relatively few sources of air pollution on the Central Karoo District and ambient air quality is generally good. The main sources of air pollution are limited industrial operations, agricultural activities, biomass burning (veld fires), domestic fuel burning, vehicle emissions, waste treatment and disposal (landfill and incineration), vehicle entrainment of dust and other fugitive dust sources such as wind erosion of exposed areas.

The closest residential development to the proposed project is the town of Laingsburg, which is 30 km northeast of the proposed development.

6.1.3 TOPOGRAPHY

The following is extracted from the Visual Impact Assessment compiled by Lourens Du Plessis and included as ***Appendix F10****.*

The study area is situated on land that ranges in elevation from approximately 680 m (in the south-east of the study area) to 1,520m at the top of the Brandkop hill (part of the future Brandvalley WEF) west of the Komsberg MTS (see **Figure 6-4**). The proposed project infrastructure is located on a plateau with terrain morphological units identified as strongly undulating plains and hills and tall hills. The larger study area is characterised by high mountains (Klein-Roggeveldberge) to the north-west and a range of mountains to the south. These mountains form the escarpments of the plateau mentioned above. Mountains to the south include:

- Tafelkop
- Gruiskop
- Kranskop
- Spitskop
- Ramkop
- Droëberg
- Losper se Berg
- Langkloof se Berg
- Kranskop
- Bokberg

Hills and ridges to the west and north of the proposed development site include:

- Skaapberg
- Appelfontein se Rant
- Perdeplaas se berg
- Kliphoogte
- Langberg

It is expected that these topographical units would influence the viewshed pattern of the proposed Esizayo Expansion Project.

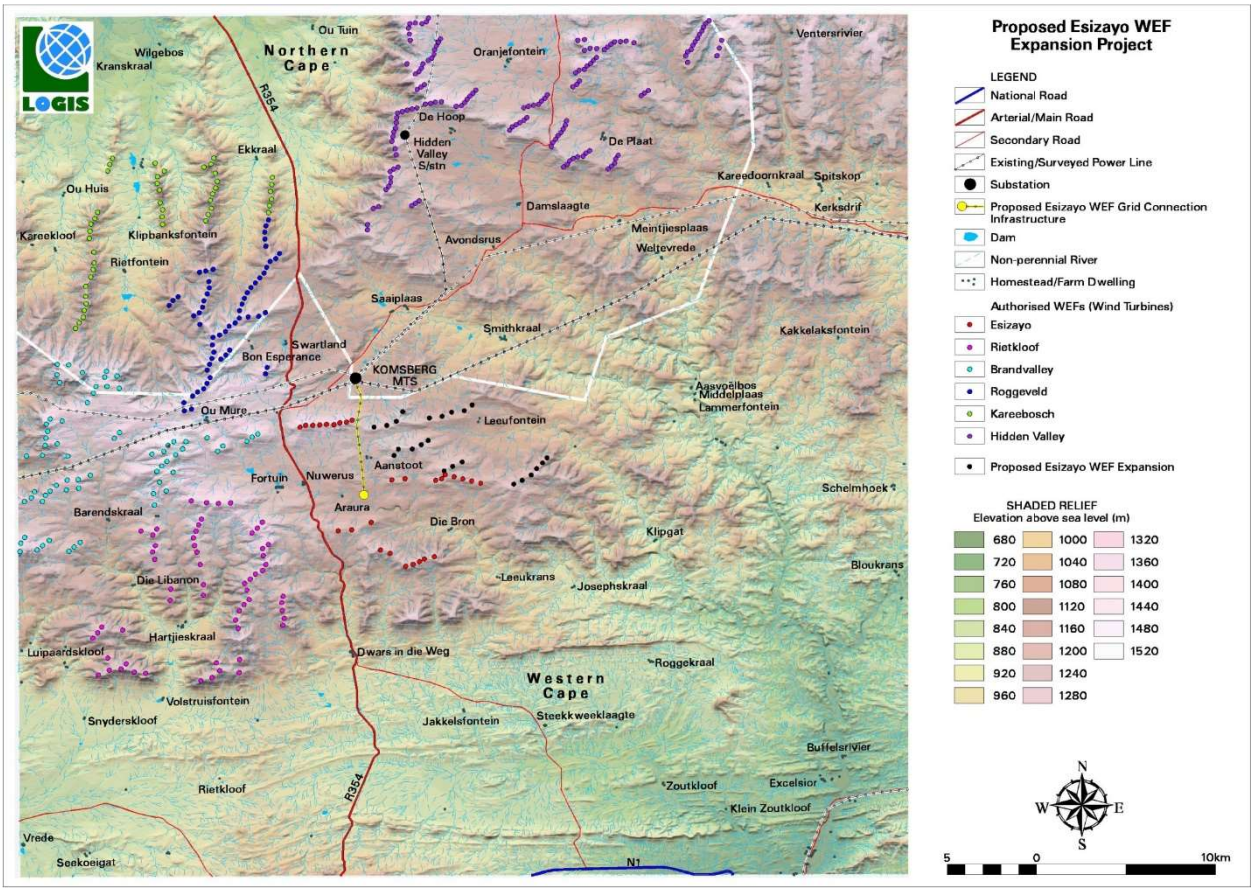


Figure 6-4: Shaded relief map of the study area (Source: Logis, 2021)

6.1.4 GEOLOGY

*The following is extracted from the Hydrological Assessment compiled by WSP and Palaeontological Assessment, complied by Natura Viva cc and included as **Appendix F7** and **Appendix F4** respectively.*

GEOLOGY

The general geological description of the area is based on the 1:1 000 000 geological map for the Northern Cape Province, published by the Trigonometrical Survey Office in 1970 (Schifano et.al.,1970). The Site is nested in the Roggeveld Mountains range, in the Larger Cape Fold belt system. The site is located on the Beaufort Series which forms part of the Karoo system. The rock type for the series comprises of shale, mudstone, sandstone and limestone (Schifano et al., 1970). During the site visit for the hydrological assessment, it was observed that shale and mudstone were the dominant rock type for the area.

The geology of the Esizayo WEF Expansion project area is outlined on the 1: 250 000 geology sheet 3220 Sutherland (Council for Geoscience, Pretoria; Theron 1983, Cole & Vorster 1999). Geologically it lies on the gently-folded northern margin of the Permo-Triassic Cape Fold Belt (CFB) and is dominated by bedrocks of the Lower Beaufort Group (Karoo Supergroup) within the Main Karoo Basin (Johnson et al. 2006). Gentle folding along west-east trending fold axes of Lower Beaufort Group bedrocks is apparent within the study area. In general, bedding dips are not high, however (15 to 25 degrees on geological map). However, some tighter, N-verging folds are evident in places. While levels of tectonic deformation are usually low with little cleavage development, pockets of cleaved mudrocks are seen locally (including pencil-cleavage is dark, fine-grained facies) as well as narrow zones of quartz veining while many channel wackes show well-developed W-E orientated sets of steep joints. Several WNW-ESE trending fracture

systems or faults cutting the Lower Beaufort Group succession can be picked out on satellite images by bush clumps and sharp bedding discontinuities, but these are not shown on the geological map. These narrow lines might be associated locally with narrow dolerite dykes (unconfirmed). Illustrated descriptions of the Lower Beaufort Group bedrocks as well as various superficial sediments encountered within the Esizayo WEF, Komsberg MTS and 132 kV grid connection project area have been given by Almond (2016f, 2019g, 2021b). The Klein-Roggeveld region to the north is covered by previous PIA studies for the Komsberg Substation and Karusa WEF by Almond (2015b, 2015c).

Only one mappable bedrock unit or formation is represented within the study area, namely fluvial, delta platform and lacustrine mudrocks and sandstones of the Abrahamskraal Formation (Lower Beaufort Group / Adelaide Subgroup) of Middle Permian age (cf Johnson et al. 2006, Day and Rubidge 2014, Wilson et al. 2014, Cole et al. 2016 and references therein). However, exposure levels of these sedimentary bedrocks are generally very low and mainly confined to occasional stream and erosion gullies. Satellite imagery shows that good exposures of potentially fossiliferous bedrocks are generally not found along most ridge crests where most key WEF infrastructure (e.g., turbines, internal road network) will be sited. Only the lower portion of the Abrahamskraal Formation succession, close to the lower contact with the Waterford Formation and extending at most a few 100 m above the incoming of reddish mudrocks, is represented within the grid corridor project area. This succession largely corresponds to the Combrinkskraal Member sensu lato as originally defined but may include the Combrinkskraal and Grootfontein Members, and perhaps even higher beds, as more recently defined by Day & Rubidge (2014).

LAND COVER

Based on the Mucina and Rutherford (2006) natural vegetation classification map, the area is mostly Central Mountain Shale Renosterveld, with a minor contribution of Koedoesberge-Moordenaars Karoo. The Department of Agriculture, Forestry and Fisheries (DAFF) define the land use within the Site, as predominantly Shrubland and Low Fynbos (DAFF, 2012).

During the site visit, the vegetation was identified as mostly shrub-like vegetation and Fynbos. Patches of cultivated areas were observed; however, these were no longer in use. Indigenous antelope (Springbok) were present within the site boundary.

GEOTECHENCIAL ENVIRONMENT

According to the 1: 250 000 Geological Map (3220) of Sutherland published by the Council for Geoscience, the study area is underlain by rock units of the Abrahamskraal (Pa) Formation which forms part of the Adelaide Subgroup, forming part of the Beaufort Group. The Beaufort Groups forms part of the greater Karoo Supergroup.

The Abrahamskraal Formation (Pa) is represented by grey and green mudstone, siltstone and subordinate sandstone. Thin chert beds are common on the lowermost red mudstones of the Abrahamskraal Formation.

Regional measurements indicate that the rock units dip 05° in a easterly direction, 10° in a north westerly and south westerly direction, 30° in a westerly direction, 135° in a south westerly direction and 315° in a north westerly direction. The sedimentary rocks in the area have been acted upon by numerous tectonic forces resulting in fold structures. Based upon the geology map, eight fold features are located within the study area. The fold axes trend in an E-W direction and represent localized synclines and anticlines which form part of the Cape Fold Belts. A Geological Map is presented in **Figure 6-5**.

The engineering geology refers to the engineering characteristics of natural earth material for founding structures and suitability for construction material purposes.

The study area is characterized by a Weinert N value of more than 10, meaning that the type of weathering is primarily by mechanical disintegration. Shallow residual soils are commonly granular and gravelly (Brink, 1983).

The study area is dominated by the Abrahamskraal Formation. Colluvial deposits can be anticipated along hillslopes with alluvial deposits anticipated near drainage features.

Based on previous investigations in the greater Roggeveld area, blocky, greyish-red mudstone with interbedded grey very fine to medium-grained quartzofeldspathic sandstone can be anticipated.Weathered, limestone layers of up to

1.5m in thickness may be present. Greenish-grey cherty layers, of a few centimetres to two metres thickness, may also be present in the Abrahamskraal formation. The chert and limestone layers possess potentially soluble properties.

Where material is required for the construction of roads and laydown areas, natural gravely or crushed sandstone bedrock can potentially be a suitable source. Consideration must be given to the presence of excessive pyrite and muscovite which can cause distress where sandstone is used as basecourse (Brink, 1983). In addition, where chemical stabilization is required the clay matrix of sandstones make them suitable for stabilization with lime (Brink, 1983). The occurrence, nature, material quality and quantity of sandstone and other potential construction material will have to be assessed during the detailed geotechnical investigation.

Mudrocks such as siltstone, mudstone and "mud-shales" are not considered suitable for use as construction material, due to their swelling characteristics, excessive absorption of water, poor engineering performance and lack of durability. Slope stability issues can arise in areas where closely intercalated sandstones and mudrock exist. When mudrocks slake or disintegrate the exposed sandstone layers are undercut, this can result in rockfalls (Brink, 1983). Based on previous investigations in the surrounding area, concave cave structures can be anticipated through erosion of the less-competent shale and mudstone bedrock beneath the hard sandstone beds when exposed to the elements.

Based on previous investigations in the Sutherland area (Verlatekloof Pass), the Abrahamskraal Formation is represented by maroon mudstone, greenish grey siltstone and olive grey sandstone. These sedimentary units are intercalated and display variable weathering, as described for the Formation.

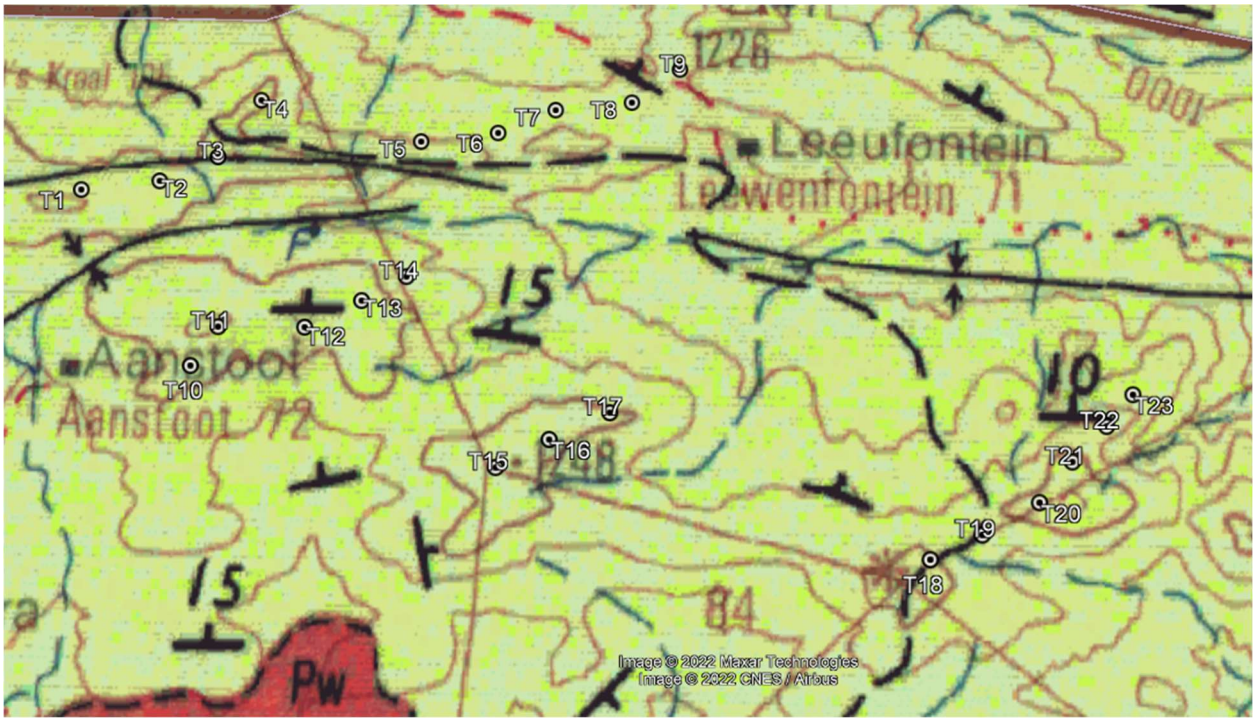


Figure 6-5: Geological Map

Competent, founding conditions for the turbines, substation, crane pads and the construction camps are anticipated at relatively shallow depths in slightly weathered bedrock, which will have to be assessed during the detailed investigation stage of the project, prior to construction.

From a preliminary geological and geotechnical assessment, no fatal flaws have been identified. It is recommended that the turbines be constructed on relatively flat to gentle terrain, open areas with maximum wind exposure.

6.1.5 SOILS AND AGRICULTURE POTENTIAL

The following is extracted from the Soils and Agriculture Assessment compiled by WSP and included as ***Appendix F6****.*

SOIL FORM IDENTIFICATION AND CLASSIFICATION

Based on the information included in the land type maps of South Africa (AGIS, 2007) the soils in the region are mostly classified as the Glenrosa and/or Mispah forms with lime generally present in the landscape and miscellaneous land classes, rocky areas with miscellaneous soils.

The two soil forms that dominate the site - as described by the South Africa taxonomic system - are the Glenrosa and Mispah soil forms. As these soil forms only vary by depth, they have been categorised together (see Table 3 and Figure 3).

MISPAH

The Mispah soil form is characterised by an Orthic A horizon over a yellow-brown apedal B horizon over hard rock. As seen at the study site – a thin red or yellow-brown apedal horizon exists, with very low organic matter.

GLENROSA

The Glenrosa soil form is characterised by an Orthic A horizon overlying a lithocutanic B horizon that merges into the underlying weathering rock. These soils are deeper than Mispah soils but are still shallow, stony soils.

The soil forms identified in the project area are shown in **Figure 6-6**.

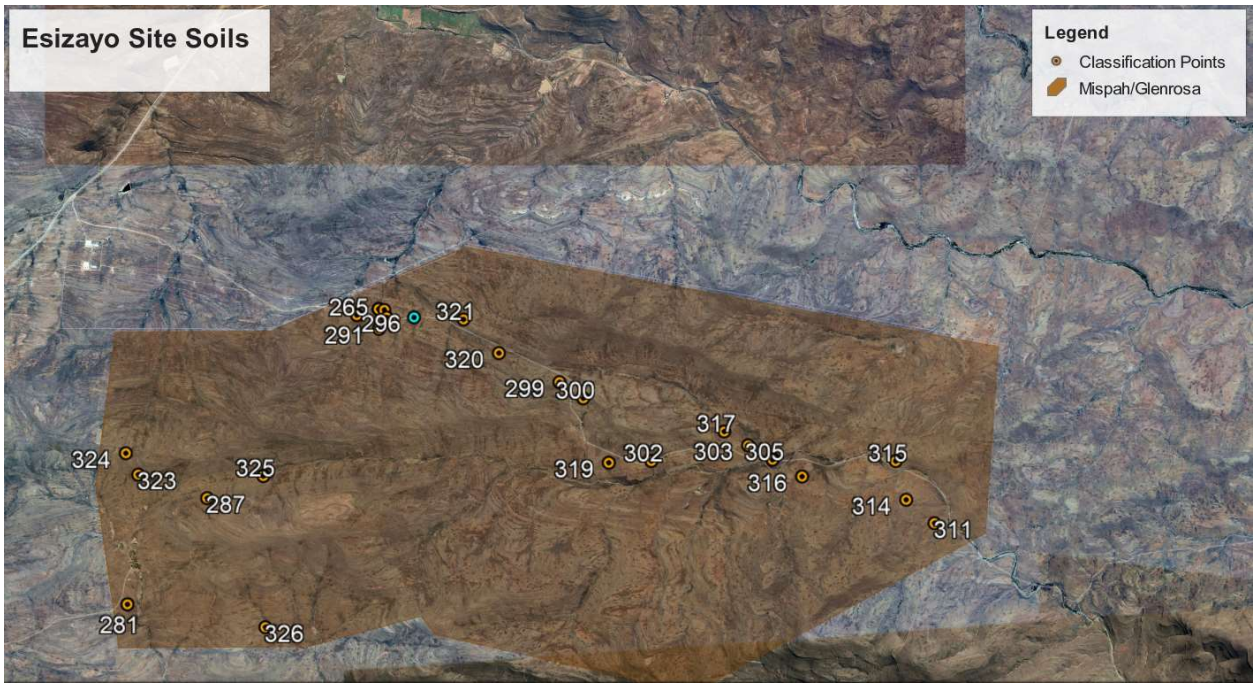


Figure 6-6: Map depicting dominant soil forms in the focus area

CURRENT LAND USE

Attempts to cultivate a few, small portions of the site have been abandoned. The site is covered by tufts of natural grasses and areas of bare rock and shallow soil. A tortoise was identified during the site visit.

Land capability is the inherent capacity of land to be productive under sustained use and specific management methods. The land capability of an area is the combination of the inherent soil properties and the climatic conditions as well as other landscape properties, such as slope and drainage patterns that may have resulted in the development of wetlands, as an example.

Using the South African soil classification guidelines (Scotney et al., 1987), the land capability of the Mispah and Glenrosa soils was established as Land Capability Group 'Grazing' and Land Capability Class VIII, as they have 'Very severe limitations and are suitable only for natural vegetation,' and can be used for (in order of increased intensity of use) 'Wildlife, Forestry and Light Grazing' (Table 1, Scotney et al., 1987).

Using the Alternative Capability Assessment system, the Capability Class for Agriculture remains 'Very Poor' with 'Severe, Long-Term, and Irreversible' Limitations (**Table 6-2**). These limitations include a lack of depth and organic matter. The soils identified are not shrink-swell clays, not organic soils and are not poorly graded. Please note that this assessment system was based on an in-field classification assessment by a registered soil scientist using a hand-held auger only, so is indicative and cannot take the place of a geotechnical or engineering study.

There are no areas on site that need to be buffered or avoided.

Table 6-2: Alternative Capability Assessment – Agriculture

PROPOSED USE		AGRICULTURE	COMMENTS
Limitations		Lack of depth, subsoil wetness, shrink-swell clays, lack of organic matter, stoniness	Shallow to very shallow, stony Mispahs and Glenrosas. Thin, infertile A-horizon. No signs of wetness, no shrink-swell clays.
Capability Class		Limitations To Proposed Use	
1	Very good	None or Marginal	
2	Good	Slight	
3	Fair	Moderate	
4	Poor	Considerable, Long-Term	
5	Very Poor	Severe, Long-term, Irreversible	

6.1.6 SURFACE WATER

*The following is extracted from the Hydrological Assessment compiled by WSP and included as **Appendix F7**.*

The Project boundary lies within quaternary catchment J11D (**Figure 6-7**), with the hydrological characteristics summarised in **Table 6-3**, including catchment area, Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR). The MAE largely exceeds the MAP, reinforcing the arid conditions of the region.

Table 6-3: Quaternary J11D Hydrological Characteristics (Source: WRC/DWA, 2012)

QUATERNARY	CATCHMENT AREA (KM^2)	MAP (MM)	MAE (MM)	MAR (MCM)
J11D	801	240	2000	5.58
J11E	812	188	2060	3.50

During the site visit there were several watercourses/drainage channels present within the area, the main river being the Roggeveld, which is south of the Project site. During the site visit, all the watercourses were dry with the exception of an un-named tributary, where a shallow pool was observed. Given the arid climatic condition of the region, the majority of the watercourses are ephemeral and are likely to only convey water during infrequent high rainfall events.

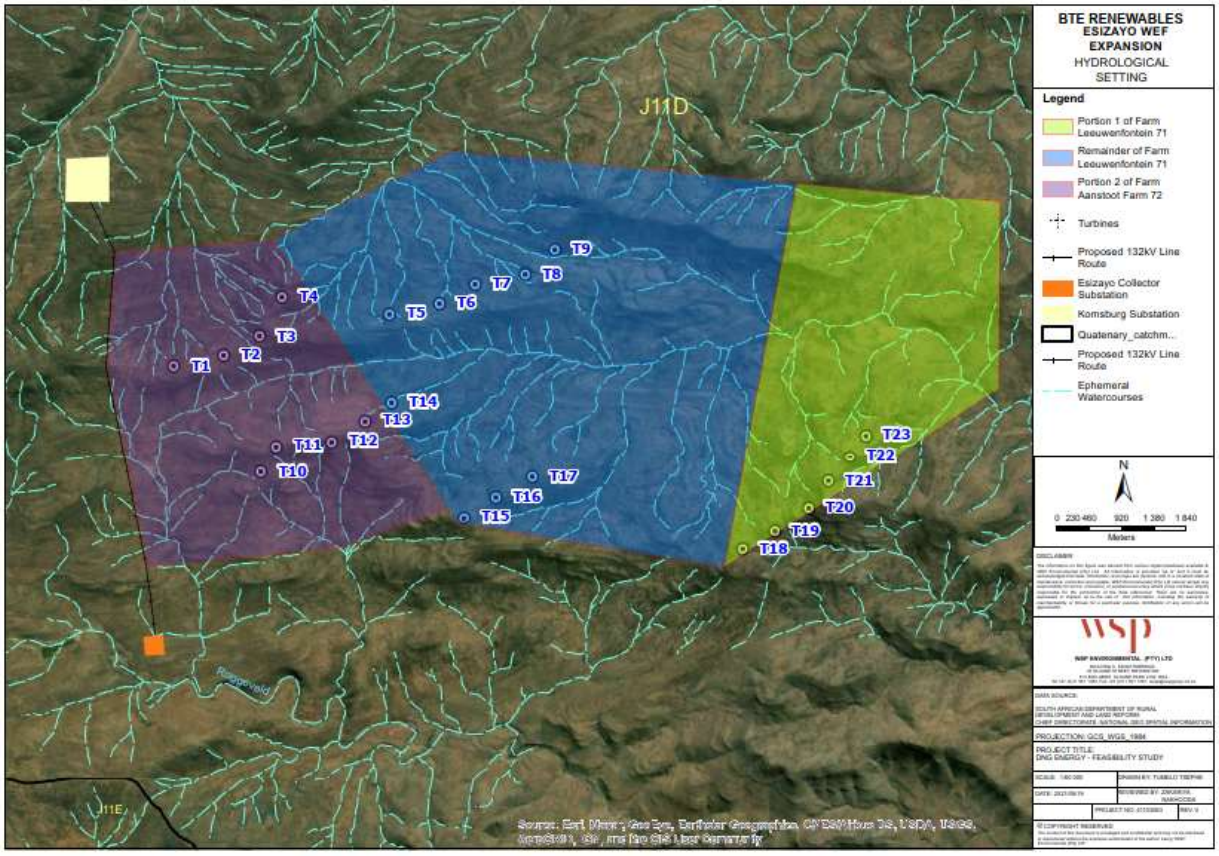


Figure 6-7: Hydrological Setting

There are numerous dry natural channels which drain the area of water from a westerly to easterly direction. The water courses are generally ephemeral in nature which seldom shows evidence of surface water runoff due to the arid conditions of the area. The Project footprint drains into the Maintjiesplaas and Roggeveld Rivers, which flow into the Buffels River.

6.1.7 WETLANDS

The following is extracted from the Freshwater Habitat Delineation compiled by WSP and included as ***Appendix F8.***

According to the NFEPA database, a total of nine wetlands were identified within the of the Project area (**Table 6-4**).

Table 6-4: NFEPA Wetlands located within the project area

HGM UNIT	NATURAL / ARTIFICIAL	NFEPA CONDITION
Seep (S1)	Artificial	Z3
Seep (S2)	Natural	Z3
Seep (S3)	Artificial	Z3
Seep (S4)	Artificial	Z3
Seep (S5)	Natural	AB
Seep (S6)	Artificial	Z3

During the site visit, it was observed that Seep (S5) was representative of a channelled Valley Bottom type wetland and is currently utilised for small scale agricultural practices. The remaining Seep wetlands were observed as being dams that were located on the ephemeral tributaries.

A desktop assessment, utilising aerial imagery (2004 – 2022) and available datasets (NFEPA, 2011), was conducted to determine potential wetland or riparian habitats in the area under consideration. An in-field assessment was conducted in March 2022. The desktop review and subsequent infield assessment (through soil sampling and an analysis of vegetation) identified three seasonal channelled valley-bottom (CVB) wetlands and riparian zones associated with the ephemeral headwaters and tributaries (**Figure 6-8**). The setting of the identified wetland was classified as per **Table 6-5**.

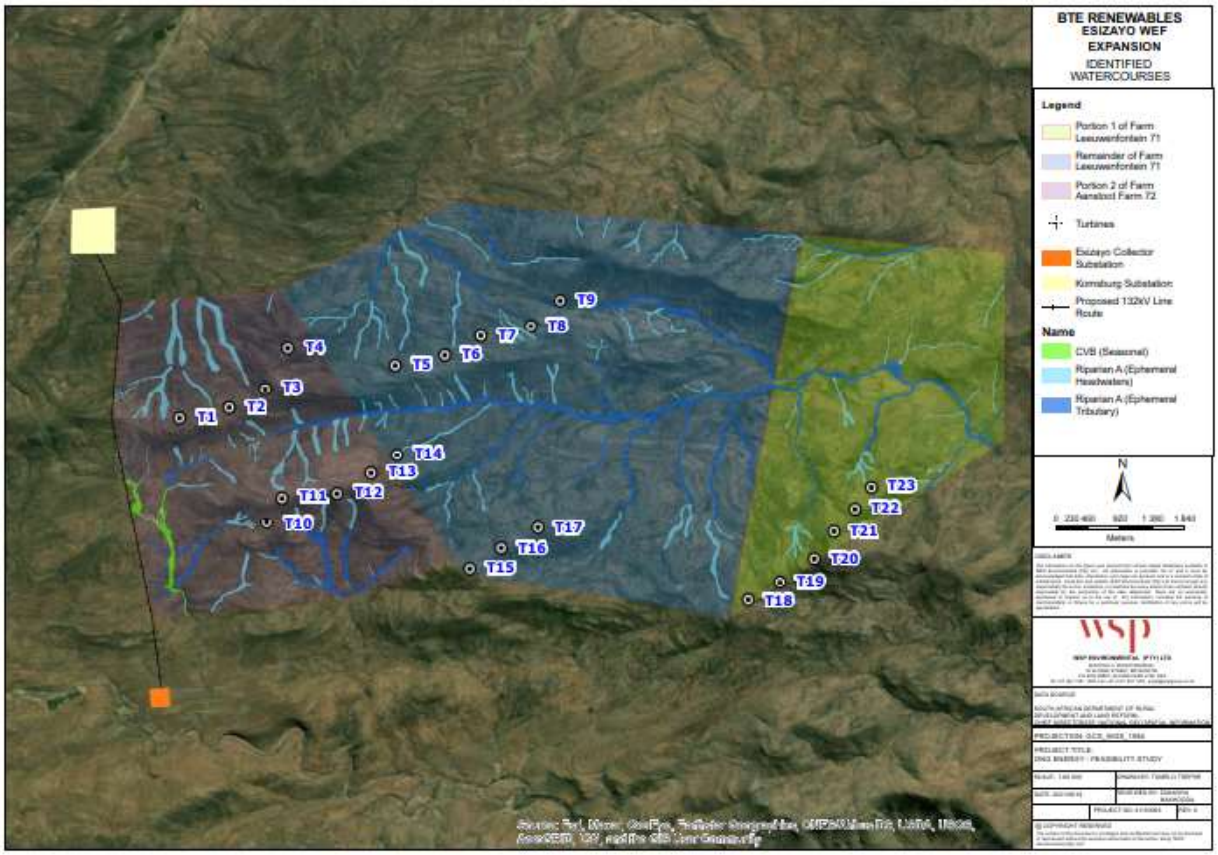


Figure 6-8: **Wetlands identified within the project area**

Table 6-5: **Wetland/Watercourse unit setting**

UNIT	REGIONAL SETTING (LEVEL 2) (NFEPA WETVEG)	LANDSCAPE SETTING (LEVEL 3)	HGM UNIT (LEVEL 4)
CVB 1,2 and 3	Karoo Shale Renosterveld	Valley Bottom	Channelled Valley Bottom
Riparian Zone (Headwaters)		Slope	Riparian Zone
Riparian Zone (Tributaries)		Slope	Riparian Zone

6.1.8 ECOLOGICALLY IMPORTANT LANDSCAPE FEATURES

The following is extracted from the Biodiversity Impact Assessment compiled by The Biodiversity Company and included as ***Appendix F2****.*

ECOSYSTEM THREAT STATUS

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the PAOI overlaps with LC ecosystems (**Figure 6-9**).

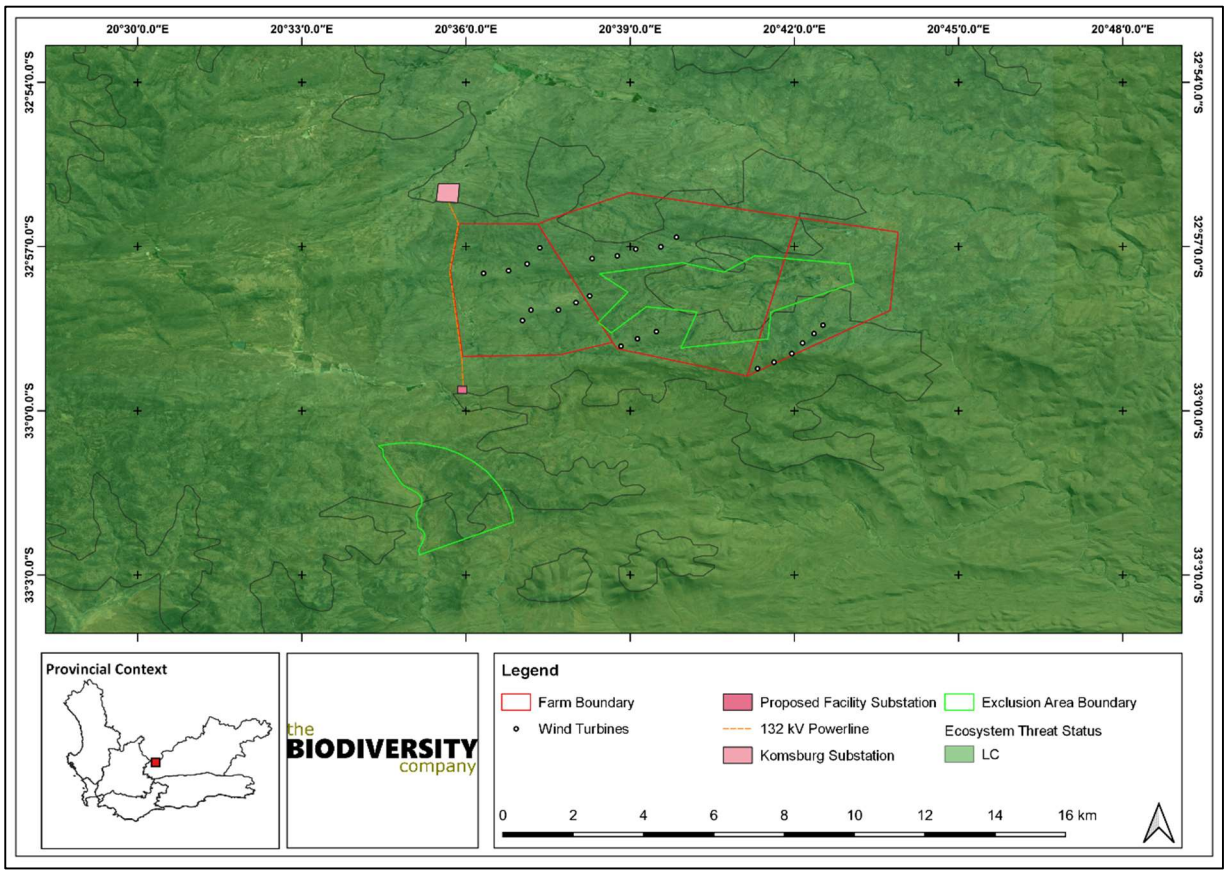


Figure 6-9: Map illustrating the ecosystem threat status associated with the proposed Esizayo WEF Expansion Area PAOI (Source: The Biodiversity Company, 2022)

ECOSYSTEM PROTECTION LEVEL

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with NP ecosystems (**Figure 6-10**).

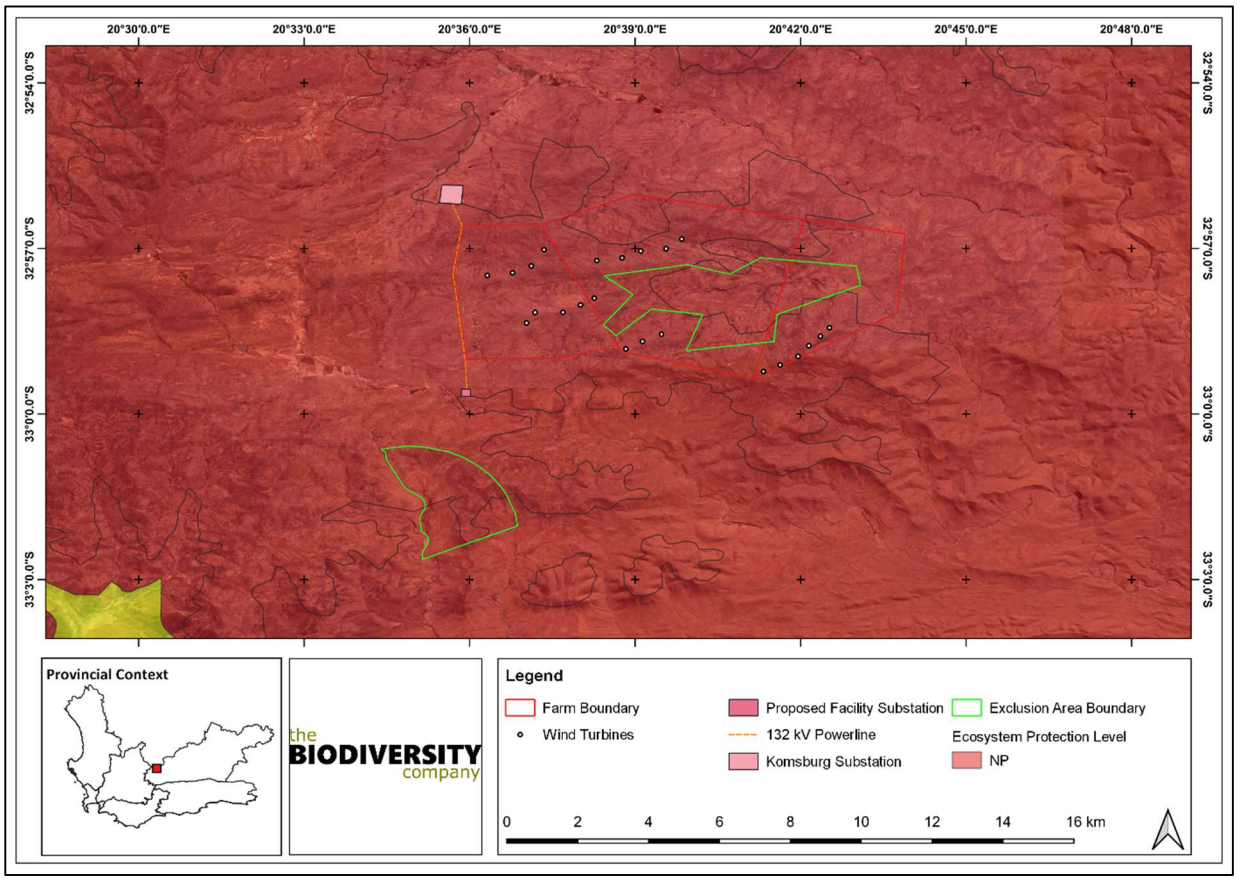


Figure 6-10: Map illustrating the ecosystem protection level associated with the proposed Esizayo WEF Expansion Area PAOI (Source: The Biodiversity Company, 2022)

PROTECTED AREAS

According to the SACAD and SAPAD dataset (DFFE, 2021a), the proposed development area does not occur within any protected area (**Figure 6-11**). The Witteberg Nature Reserve, Anysberg Provincial Nature Reserve and Zuurkloof Private Nature Reserve are located approximately 35 km to the south. These are located within the Gouritz Cluster Biosphere Reserve, which is an Internationally recognised conservation area. The proposed development is unlikely to influence these protected areas as they are situated outside of the buffer zone required to maintain the functioning of protected areas. Nevertheless, the proposed development overlaps with a NPAES Focus Area, namely the Western Karoo focus area. In the NPAES, an area is considered important for the expansion of the land-based protected area network if it contributes to one or more of the following:

- Meeting biodiversity thresholds for terrestrial or freshwater ecosystems;
- Maintaining ecological processes; and
- Resilience to climate change.

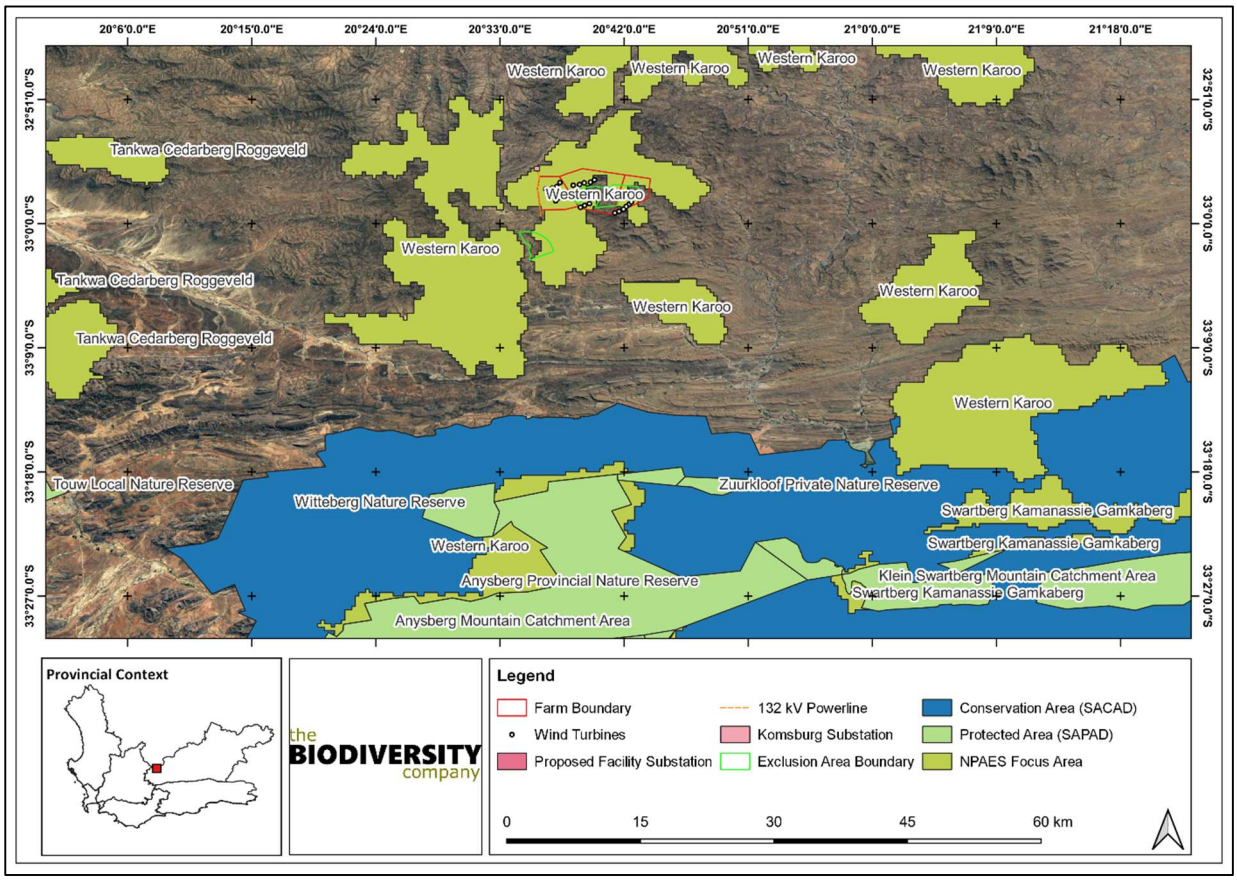


Figure 6-11: Map illustrating the location of protected areas proximal to the proposed WEF Expansion Area PAOI (Source: The Biodiversity Company, 2022)

CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

The Western Cape Biodiversity Spatial Plan (BSP) was updated in 2017. It classifies areas into Critical Biodiversity Areas (CBA1 or CBA2), Ecological Support Areas (ESA1 or ESA2), Other Natural Areas (ONA) and Protected Areas (PA). **Figure 6-12** shows that the Project area overlaps with areas classified as:

- CBA1;
- ESA1;
- ESA2; and
- ONA.

The definition of these categories and their respective management objective as provided in Pool et al (2017) are summarised in **Table 6-6**.

The BSP features that overlap the PAOI were categorised as such due to the presence of threatened vertebrates and watercourse protection. The proposed development will result in the degradation of the ecological condition of the habitats within the PAOI as well as further threaten Species of Conservation Concern (SCC) and therefore, the area will no longer be regarded as a CBA. Notably, most of the CBA is located external to the exclusion and therefore, this exclusion area is not effective in maintaining the integrity of the CBA.

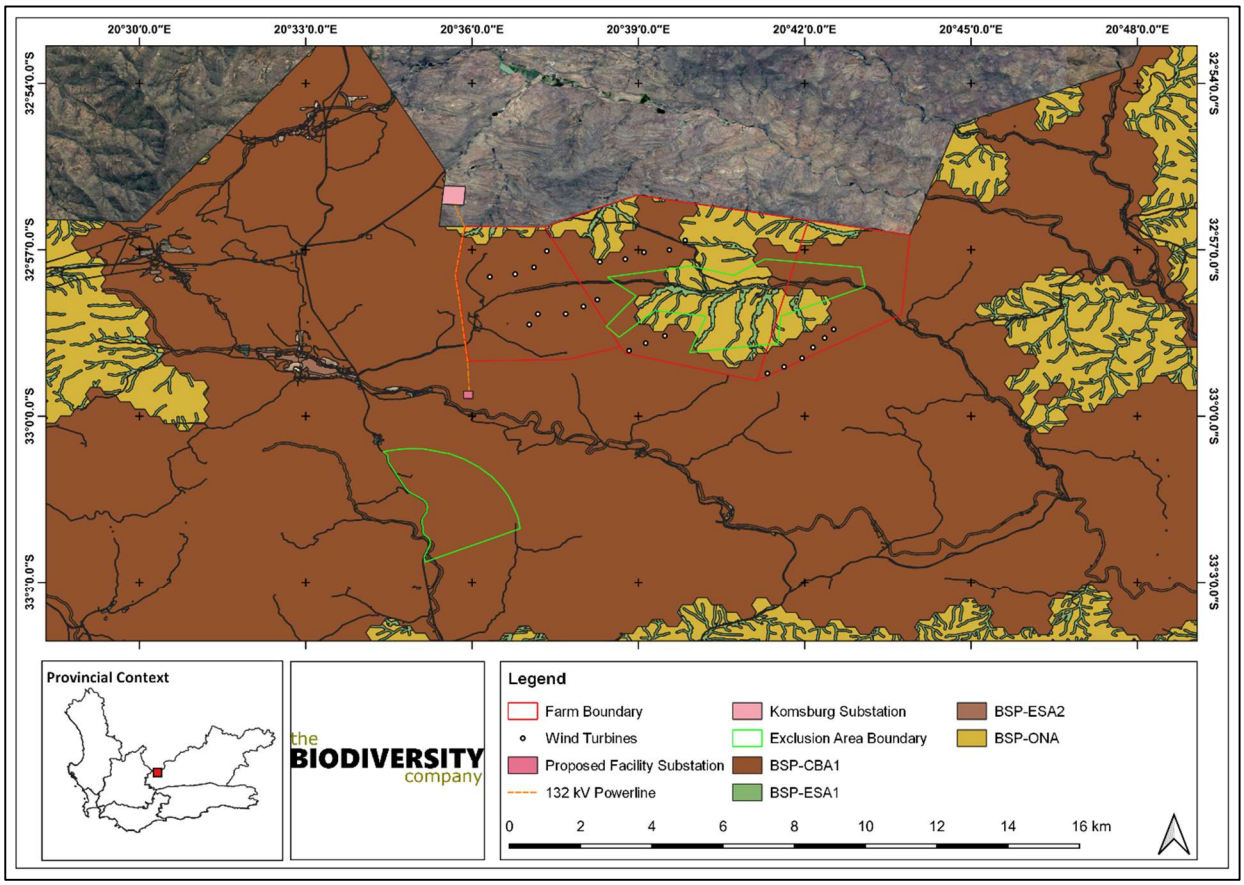


Figure 6-12: Map illustrating the proposed Esizayo WEF Expansion Area PAOI overlaid onto the Western Cape Critical Biodiversity Areas (Source: The Biodiversity Company, 2021)

Table 6-6: Summary of Biodiversity Spatial Plan categories within the context of the Esizayo Wind Energy Facility (Pool et al, 2017)

CATEGORY	DEFINITION	MANAGEMENT OBJECTIVE
CBA1	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
ESA1	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
ESA2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs and are often vital for delivering ecosystem services.	Restore and/or manage to minimise impact on ecological infrastructure functioning, especially soil and water-related services.

CATEGORY	DEFINITION	MANAGEMENT OBJECTIVE
ONAs	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.

HYDROLOGICAL CONTEXT

The PAOI is located within the Gamka Catchment i.e., secondary catchment J2. The watercourses in the PAOI are characterised as non-perennial system, with an unnamed tributary of the Roggeveld River traversing the PAOI (**Figure 6-13**).

The ETS is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. The threat status of the unnamed tributary and the associated reach of the Roggeveld River is categorised as LC PAOI (**Figure 6-13**). In addition, the associated wetland systems are also categorised as LC.

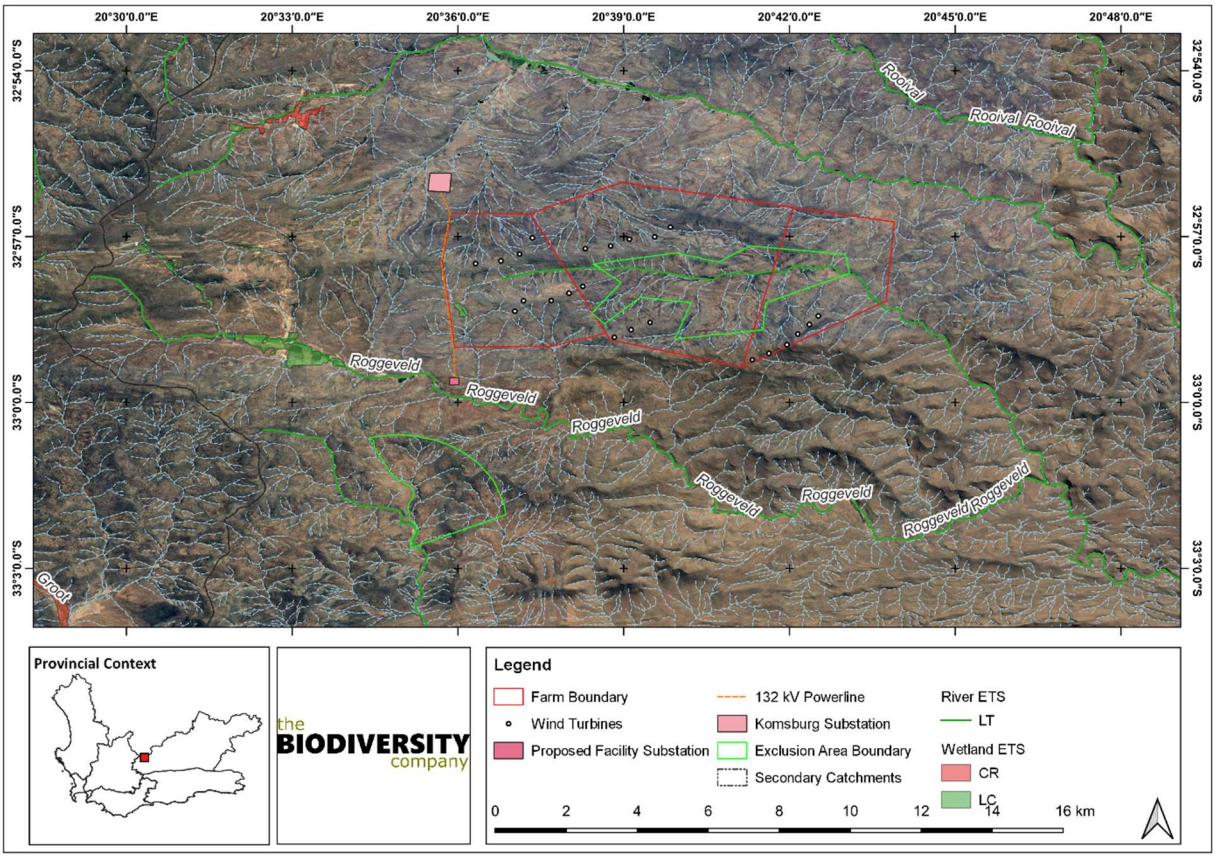


Figure 6-13: Map illustrating the Ecosystem Threat Status of the Orange River reach proximal to the proposed Esizayo WEF Expansion Area PAOI (Source: The Biodiversity Company, 2021)

The National Freshwater Ecosystem Priority Area (NFEPA) database forms part of a comprehensive approach of the sustainable and equitable development of South Africa's scarce water resources. The NFEPAs are intended to be

conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel et al., 2011). The Roggeveld River and the associated unnamed tributary traversing the PAOI are categorised as Upstream Management Areas. Potential impacts arising from the proposed development such as petrochemical spills from heavy machinery and erosion will negatively impact the functioning of these systems, thereby impeding their ability as functioning as important upstream resources.

6.1.9 VEGETATION

The following is extracted from the Biodiversity Impact Assessment compiled by The Biodiversity Company and included as ***Appendix F2****.*

The proposed development is situated within the Renosterveld ecosystem of the Fynbos Biome and the Rainshadow Valley Karoo of the Succulent Karoo Biome., as indicated in **Figure 6-14**, and which are discussed below.

The proposed WEF Expansion is situated within Renosterveld, which is an evergreen, fire-prone shrubland dominated by evergreen asteraceous shrubs, principally *Dicerothamnus rhinocerotis*, and possesses a high biomass and diversity of geophytes. The proposed development overlaps with Shale Renosterveld. This broad-scale vegetation type accounts for 86% of the total area of Renosterveld. Rainfall patterns permit a relatively high proportion of grass cover and abundance of non-succulent shrubs, and therefore, the structure of the vegetation is more congruent with proximal karoo types than other Renosterveld types.

A landscape-scale ecosystem process that is important for maintaining the wellbeing of Renosterveld is fire. Fire is a disturbance that creates gaps in plant communities which provide space for plant establishment. Disturbance by fire can contribute to the maintenance of diversity and spatial heterogeneity by impeding competitive exclusion. In addition, the ethylene gas produced from veld fires stimulates flowering and the karrikins within the smoke stimulates seed germination. Regarding the dynamics of Mountain Renosterveld, vegetation cover begins to re-establish within the first nine months following the fire and remains at a relatively high level from years 3 to 10 (van der Merwe & van Rooyen, 2011). There is a distinctive species composition between the first two years (years 1 and 2) following the fire and the remaining years (year 3 to 10).

The Succulent Karoo encompasses an interrupted belt from the coastal regions near Lüderitz, Namaqualand (on and west of the Escarpment), the Hantam, Tanqua and Roggeveld region and the Little Karoo. The Succulent Karoo Biome is biologically distinct on a global scale with a high level of endemism. This vegetation type is characterised by a dominance of succulent species, particularly from the families Aizoaceae, Crassulaceae and Euphorbiaceae. Moreover, there are leaf succulents in families not typically associated with succulent growth forms. The Succulent Karoo is also a recognised global biodiversity hotspot and is considered the most diverse arid region in the world (www.conservation.org). This diversity and endemism of flora in turn support a high diversity and level of endemism of faunal groups.

On a fine-scale vegetation type, the PAOI overlaps with two vegetation types, namely the Central Mountain Shale Renosterveld and Koedoesberge-Moordenaars Karoo (Figure 6-14). Central Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and south-eastern slopes of the Klein Roggeveldberge and Komsberg, below the Komsberg section of the Great Escarpment, as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area.

The Central Mountain Shale Renosterveld type is poorly known. This vegetation type is described as follows:

- Topography – Slopes and broad ridges of low mountains and escarpments;
- Geology – Clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones. Glenrosa and Mispah forms are prominent;
- Climate – Arid to semi-arid climate. MAP 180 – 410 mm, with relatively even rainfall throughout the seasons, albeit minimally elevated during Autumn-Winter. Mean daily maximum and minimum temperatures 29.9˚C and 0.9 ˚C for January and July, respectively; and
- Important Taxa;

- Low shrubs: *Elytropappus rhinocerotis, Diospyros austro-africana, Eriocephalus africanus var. africanus, E. ericoides subsp. ericoides, E. grandifloras, Felicia ovata, Pteronia glauca, P. incana, P. sordida, Zygophyllum spinosum*.
- Succulent shrubs: *Delosperma subincanum, Drosanthemum lique, Euphorbia stolonifera, Trichodiadema barbatum, Tylecodon reticulatus subsp. reticulatus, T. wallichi subsp. wallichi*.
- Geophytic herbs: *Bulbine asphodeloides, Drimia intricate, Othonna auriculifolia, Oxalis obtusa*.
- Succulent Herbs: *Crassula deceptor, C. muscosa, C. tomentosa var. glabrifolia, Senecio radicans*.

The Koedoesberge-Moordenaars Karoo vegetation type is described as follows:

- Topography – Slightly undulating to hilly landscape.
- Geology – Mudstone, shale and sandstone of the Adelaide Subgroup, accompanied by sandstone, shale and mudstone of the Permian Waterford Formation and sandstone and shale of other Ecca Group Formations as well as Dwyka Group diamictites. This geology gives rise to shallow, skeletal soils.
- Climate – Mean annual precipitation approximately 200 mm. Mean annual temperature is 16 °C.
- Biogeographically Important Taxa;
  - Succulent Shrubs: *Deilanthe peersii, Hereroa crassa, Pleiospilos nelii, Rhinephyllum graniforme, Ruschia crassa, R. perfoliata.*
  - Low Shrubs: *Felicia lasiocarpa, Sericocoma pungens*.
  - Herbs: *Helichrysum cerastoides var. aurosicum, Ifloga molluginoides*.
  - Geophytic Herbs: *Brunsvigia comptonii, Drimia karooica*.
  - Succulent Herbs: *Aloe longistyla, Crassula hemispaerica, Pectinaria comptus, Quaqua parviflora subsp. gracilis, Tridentata parvipuncta subsp. parvipuncta*.
- Endemic Taxa;
  - Succulent Shrubs: *Antimima karroidea, A. loganii, Calamophyllum teretiusculum, Cerochlamys gemina, Drosanthemum comptonii, Rushcia karrooica, Tanquana archeri, Trichodiadema halii, Tylecodon faucium*.
  - Low Shrub: *Pelargonium stipulaceum subsp. ovatostipulatum. Semiparasitic*
  - Shrub: *Thesium marlothii.*
  - Geophytic Herbs: *Lachenalia comptonii, Strumaria undulata*.
  - Succulent Herbs: *Haworthia nortieri var. pehlemanniae*.

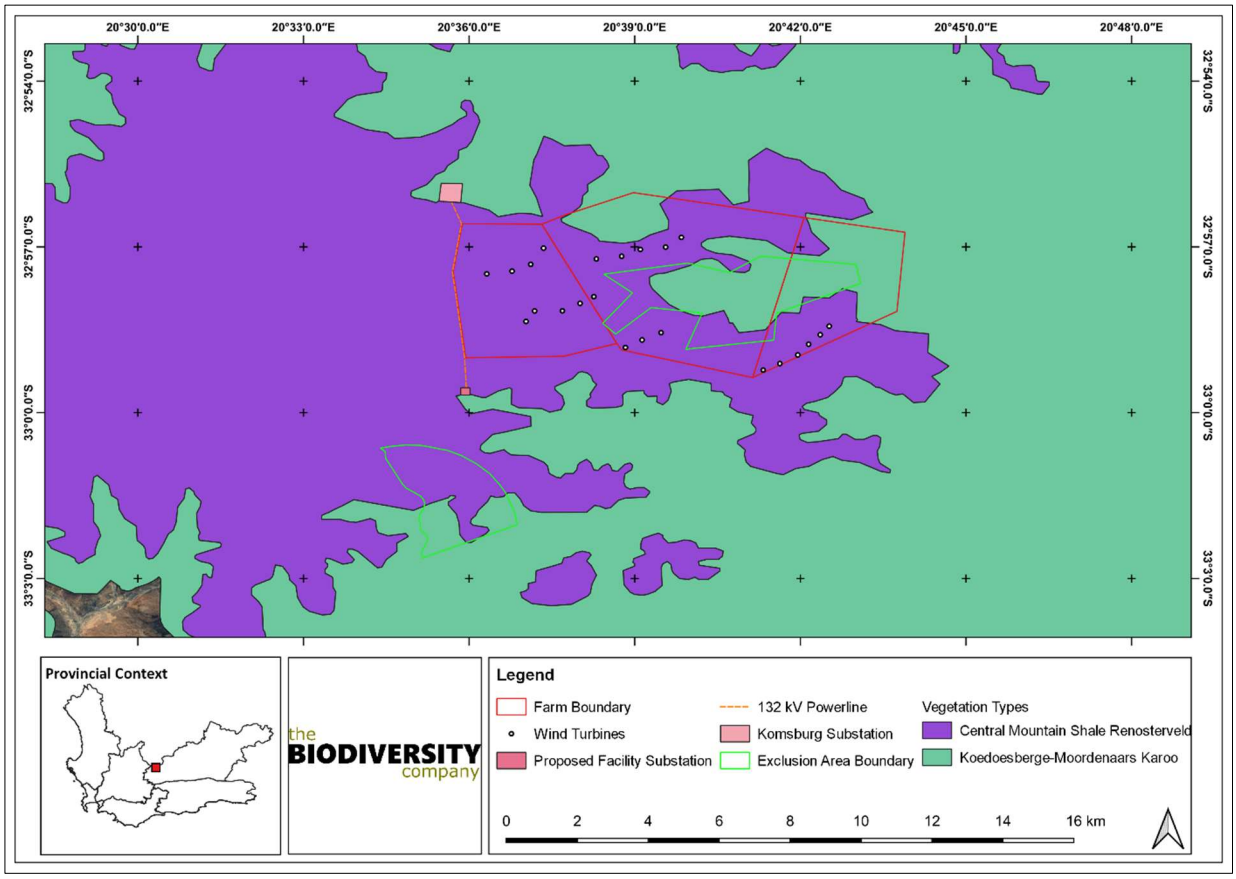


Figure 6-14: Map illustrating the vegetation types within the proposed Esizayo WEF Expansion Area PAOI (Source: The Biodiversity Company, 2021)

EXPECTED FLORA SPECIES

The Plants of South Africa (POSA) database indicates that 225 species of indigenous plants are expected to occur within the PAOI and surrounding landscape. Based on the POSA database and the reports reviewed, ten (10) flora SCC are expected to occur within the PAOI. All these expected SCC are endemic to South Africa. The likelihood of occurrence was determined by considering the species habitat requirements and examining records on the Global Biodiversity Information Facility (GBIF) database **Table 6-7**.

Table 6-7: Threatened flora species that may occur within the proposed Esizayo WEF Expansion Area PAOI

FAMILY	SPECIES NAME	CONSERVATION STATUS	ENDEMISM	HABITAT	LIKELIHOOD OF OCCURRENCE
Aizoaceae	*Antimima pumila*	DDT	Endemic	Rocky slopes, possibly favouring south-facing slopes.	Confirmed
Asteraceae	*Eriocephalus grandiflorus*	Rare	Endemic	Lower foothills in quartz patches.	High

FAMILY	SPECIES NAME	CONSERVATION STATUS	ENDEMISM	HABITAT	LIKELIHOOD OF OCCURRENCE
Crassulaceae	*Adromischus mammillaris*	EN	Endemic	Lower gravely slopes. EOO 500 km², known only from two locations.	High
Fabaceae	*Lotononis venosa*	EN	Endemic	Open karroid scrub on sandy clay alluvium. Known only from four locations. Extent of occurrence 84 km² and area of occupancy 16 km².	Moderate
Geraniaceae	*Pelargonium denticulatum*	Rare	Endemic	Sandy soils near mountain streams.	High
Hyacinthaceae	*Lachenalia longituba*	VU	Endemic	Stony clay in seasonally wet, boggy sites that bake rock hard in summer. Known from five locations. EOO 350 km², AOO <20 km².	Moderate
Iridaceae	*Geissorhiza karooica*	NT	Endemic	Coarse shale slopes. Known from six locations. EOO 497 km²	High
Iridaceae	*Ixia mollis*	VU	Endemic	Among rocks on seasonally moist south-facing sandy or clay slopes. Known from only five locations in the Olifants River Valley between Clanwilliam and Citrusdal and the western Cederberg. EOO 74 km²	Low
Iridaceae	*Romulea eburnea*	VU	Endemic	Shale soils in the Klein Roggeveld. Rare and localised as it known from only two locations.	High
Poaceae	*Ehrharta eburnea*	NT	Endemic	Rocky places in mountain renosterveld.	High

DD = Data Deficient – Taxonomically Problematic, EN = Endangered, NT = Near Threatened and VU = Vulnerable

FIELD ASSESSMENT

The following section provides the results from the field survey for the proposed development that was undertaken during February 2022.

INDIGENOUS FLORA

The species composition of the PAOI was consistent with typical Central Mountain Shale Renosterveld and Koedesberge-Moordenaars Karoo. Given that the survey was undertaken during the dry season, the species diversity observed was under-represented than during Spring (September-October). Dominant species observed within the PAOI comprised of *Dicerothamnus rhinocerotis, Euryops lateriflorus, Pteronia incana* and *Ruschia intricata.* **Figure 6-15** provides photographs of the species recorded within the PAOI. Based on the observations made by the specialist during previous surveys, geophytes and succulent growth forms are ubiquitous throughout the landscape. However, many of the geophytes were dormant during the field survey. The species protected under Western Cape legislation relevant to the proposed development area comprise of the following:

- All species of *Amaryllidaceae*;
- All species of *Asphodelaceae*;
- The following species of Crassulaceae;
  - *Crassula columnaris;*
  - *Crassula falcata;*
  - *Crassula perfoliata; and*
  - *Crassula pyramidalis.*
- All species *Iridaceae*;
- All species of *Aizoaceae*;
- All Colchicum (*Colchicaceae*);
- All Lachenalia spp. (*Hyacinthaceae*);
- All species in the genus *Anacampseros*; and
- Oxalis nutans (*Oxalidaceae).*

Antimima pumila (Aizoaceae) a species classified as DDT, was confirmed to occur within the PAOI. In addition to this species, a possible flora SCC was recorded within the PAOI. However, identification to species level is presently challenging as all specimens observed were in a dormant state. It is therefore recommended that an additional survey be undertaken during the wet season to confirm the species identification. Furthermore, an additional SCC was recorded within the proximal landscape, but it is uncertain if it occurs within the PAOI (**Table 6-8**).

Table 6-8: Indigenous flora Species of Conservation Concern recorded within the proposed Esizayo WEF Expansion Area PAOI and surrounding landscape during the survey period

FAMILY	SPECIES NAME	CONSERVATION STATUS	ENDEMISM	ECOLOGY
Aizoaceae	*Antimima cf. leipoldtii*	VU B1ab(ii,iii,iv,v)	Endemic	Presently known from 6 locations. Mainly on loamy flats or on gentle quartzitic slopes.
Amaryllidaceae	*Brunsvigia josephinae*	VU A2c; C2a(i)	Endemic	Geophyte that occurs as widely scattered subpopulations in lowland areas. Herbarium specimens record about 18 subpopulations, and it is estimated that a further 70 unrecorded subpopulations may exist. All subpopulations consist of fewer than 50 adult plants and are declining due to collection on an ongoing basis for medicinal purposes and habitat loss to agriculture. The species is restricted to heavy clay soils and as such was not observed within the PAOI, albeit if these micro-habitats are present (none were observed during the field survey), it is likely to occur at the site.

Figure 6-15: Photographs illustrating examples of the flora recorded within the proposed Esizayo WEF Expansion Area PAOI during the survey period. A) *Tylecodon wallichii*, B) *Antimima pumila*, C) *Pelargonium carnosum*, D) *Crassula deltoidea*, E) *Pelarg*

INASIVE ALIEN PLANTS

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued;
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued;
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones; and
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

— Notify the competent authority in writing;
— Take steps to manage the listed invasive species in compliance with:
  - Section 75 of the Act;
  - The relevant invasive species management programme developed in terms of regulation 4; and
  - Any directive issued in terms of section 73(3) of the Act.

Five (5) IAP species were recorded within the PAOI (**Table 6-9**) albeit only in heavily degraded areas around old homesteads and kraals. Moreover, *Erodium moschatum*, although not a listed invasive, was prevalent within the PAOI. Invasive species tend to encroach into disturbed areas and must be considered a possible risk.

Table 6-9: Summary of IAPs recorded within the proposed Esizayo WEF Expansion Area PAOI

SPECIES	GROWTH FORM	NEMBA CATEGORY	CONTROL
Erodium moschatum	Herb	-	Physical removal ensuring root system is removed.
Eucalyptus camaldulensis	Large tree	1b	Physical removal of seedlings or felling and stump herbicide treatment for large specimens
Populus x canescens	Large tree	2	Physical removal of seedlings or felling and stump herbicide treatment for large specimens
Schinus terebinthifolius	Large tree	3 (WC)	Physical removal of seedlings ensuring root system is removed. Large specimens to be felled and stump treated with herbicide.
Opuntia ficus indica	Succulent tree	1b	Physical removal of seedlings ensuring root system is removed. Large specimens to be treated with herbicide ensuring all plant material removed from site.

6.1.10 FAUNA

*The following is extracted from the Biodiversity Impact Assessment compiled by The Biodiversity Company and included as **Appendix F2**.*

Most of the project area has been historically occupied by communities and thus many of the expected faunal species has a low likelihood of occurrence due to persecution and lack of habitats arising from anthropogenic impacts.

AMPHIBIANS AND REPTILE

Based on the IUCN Red List Spatial Data and the FrogMAP database, eight amphibian species are expected to occur within the area with one of these expected species regarded as of conservation concern on a regional scale **Table 6-10**.

Table 6-10: Amphibian Species of Conservation Concern that are expected to occur within the proposed Esizayo WEF Expansion Area PAOI

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
			REGIONAL	GLOBAL	
Pyxicephalidae	*Cacosternum karooicum*	Karoo Caco	DD	LC	High

DD = Data Deficient and LC = Least Concern

Cacosternum karooicum (Karoo Caco) is listed as DD on a regional scale. The species occurs on shales of the Karoo sequence and its flattened physiognomy suggests that it is lithophilic, aestivating in rock cracks and crevices during long dry periods. Breeding usually takes place in shallow pools in the rocky beds of small, temporary streams and has also been recorded in a small man-made dam along a stream. The main threat is habitat degradation from anthropogenic land use change

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 51 reptile species are expected to occur within the area with two of these species regarded as of conservation concern **Table 6-11**.

Table 6-11: Reptile Species of Conservation Concern that are expected to occur within the proposed Esizayo WEF Expansion Area PAOI

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
			REGIONAL	GLOBAL	
Testudinidae	*Chersobius boulengeri*	Karoo Dwarf Tortoise	EN	EN	Confirmed
Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	NT	NT	High

EN = Endangered and NT = Near Threatened

Chersobius boulengeri (Karoo Dwarf Tortoise) is a South African endemic, occurring from Bruintjieshoogte in the Eastern Cape to Touwsrivier in the Western Cape; the range in the Northern Cape extends north of Williston in the northwest and beyond Vosburg in the northeast. *Chersobius boulengeri* is a habitat specialist and population densities are low and are isolated on rocky outcrops with specialized vegetation. There is no estimate of the global population, but surveys have indicated that many populations have disappeared, and population numbers have declined significantly (Hofmeyr et al, 2018a). In addition, the total population is severely fragmented. The principal threat is habitat degradation due to agricultural overgrazing and climate change. Shale gas exploration is an emerging serious threat.

Psammobates tentorius verroxii (Verrox's Tent Tortoise) is widely distributed throughout the Nama Karoo in the Northern Cape and penetrates the Western Cape and possibly the Eastern Cape peripherally. The species has been exhibiting declines and is therefore regarded as NT (Hofmeyer et al, 2018b). There is no estimate on the total global population. Threats include road mortality, veld fires, electrocution by livestock/game fences, overgrazing from domestic livestock, uncontrolled harvesting of natural products and irresponsible tourism activities in sensitive areas. Available information indicates that Pied Crow (Corvus albus) predation on this is increasingly severe, with anthropogenic facilitation of Pied Crow range expansion having led to increased predation rates (Hofmeyr et al, 2018b).

MAMMALS

The IUCN Red List Spatial Data indicates that 47 mammal species are expected to occur within the PAOI. This list excludes larger mammal species that are generally restricted to protected areas and volant mammal species which were not considered in this assessment. Eight (8) mammal SCC could be expected to occur within the PAOI **Table 6-12**.

Table 6-12: Mammal Species of Conservation Concern that are expected to occur within the proposed Esizayo WEF Expansion Area PAOI

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
			REGIONAL	GLOBAL	
Bovidae	*Pelea capreolus*	Grey Rhebok	NT	NT	Confirmed
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	Moderate

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
			REGIONAL	GLOBAL	
Felidae	*Leptailurus serval*	Serval	NT	LC	Low
Felidae	*Panthera pardus*	Leopard	VU	VU	Low
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC	Confirmed
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	CR	CR	Low
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT	Low
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	NT	LC	High

NT= Near Threatened and VU = Vulnerable

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa. This species is predominantly aquatic, and it is seldom found far from water. The main threat to the species is the declining state of freshwater ecosystems in Africa (Jacques et al, 2015). In parts of their range, they are killed for skins and other body parts, because they are regarded as competitors for food, particularly in rural areas where fishing is an important source of income, or where they are believed to be responsible for poultry losses, and damage to young maize plants.

Bunolagus monticularis (Riverine Rabbit) is endemic to the central Karoo region of South Africa. It is associated with the dense, discontinuous riparian vegetation fringing the seasonal rivers. It is dependent on soft and deep alluvial soils along the river courses for constructing stable breeding stops. The majority of Riverine Rabbit occupancy lies in the Upper Karoo Bioregion (approximately 80%), with about 12% in the Rainshadow Valley Karoo Bioregion, 4% in the Trans-Escarpment Succulent Karoo Bioregion, 3% the in Western Fynbos-Renosterveld Bioregion and 1% in the Lower Karoo Bioregion. Many of the subpopulations are now extinct and the latest estimated Area of Occupancy is only 2 943 km2 comprising of 12 sub-populations (Collins et al, 2019). The total global population is estimated at 157-207 mature individuals with a continuing decline. Subpopulations are isolated from each other by jackal-proof fencing and severe land transformation through agricultural practices. All these subpopulations are estimated to contain less than 50 mature individuals (8–46 mature individuals, based on independent sightings in each river system). Sub-populations face significant threats from ongoing habitat degradation and fragmentation due to land-use practices, such as livestock farming and new emerging habitat-transforming land uses, such as climate change and energy development (Collins et al, 2019). Reduction in streamflow due to the construction of impoundments has presumably also reduced habitat quality.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The estimated number of mature individuals is 9 707, with the population exhibiting a continuing decline (Sliwa et al, 2016). The principle long-term threat for the species is the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation (Sliwa et al, 2016). An additional threat is indirect persecution, such as accidental poisonings (for example locust spraying, predator control lures/baits) and general predator persecution throughout most of their range. The long-term effects of climate change should not be overlooked and may lead to changes in range, changes in timing of breeding events, increases in severe weather such as flooding and droughts, as well as increased disease patterns or risks of the spread of pathogens from parasites. The likelihood of occurrence for the species within the PAOI was rated as ‘High’, due to the presence of suitable habitat, burrows and available prey.

Graphiurus ocularis (Spectacled Dormouse) is endemic to South Africa, where it occurs widely in Northern Cape, Eastern Cape, and Western Cape provinces. The species is associated with the sandstone formations, which have many vertical and horizontal cracks and crevices which provide shelter and nesting sites. The current population size is not

known, but the species is not regarded as common densities ranging between 1.8 and 3.1 individuals/ha (Wilson et al, 2016). While the reporting frequency has been stable over the 10 years (1.2 ± 0.4 records / year) since 2005, it is 53% lower on average (2.5 ± 1.9 records / year) than the 10-year reporting frequency for the previous national assessment. Threats include ongoing habitat loss and habitat fragmentation, because of plantations and vineyards, that may impact immigration and gene flow between isolated habitats (Wilson et al, 2016). In addition, climate change may further shrink its range southwards.

Leptailurus serval (Southern Serval) is widely distributed throughout sub-Saharan Africa but has specific habitat requirements and therefore restricted to certain areas. Thy typically favour savanna long-grass environments in high rainfall areas and are particularly associated with reedbeds and other riparian vegetation types (Thiel, 2019). The global population number is unknown. L. serval specializes in preying on small mammals, particularly rodents. The major threat is wetland habitat loss and degradation. Wetlands harbour comparatively high rodent densities compared with other habitat types and form the core areas of L. serval home ranges (Thiel, 2019). Degradation of grasslands through annual burning followed by over-grazing by domestic livestock, leading to reduced abundance of small mammals is a further threat.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (Stein et al, 2020). There are few reliable data on changes in the status (distribution or abundance) throughout Africa over the last three generations, although there is compelling evidence that subpopulations have likely declined considerably. Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (Stein et al, 2020).

Pelea capreolus (Grey Rhebok) is a South African endemic and is patchily distributed in areas with rocky hills and grassy mountain slopes, as well as plateau grasslands in the eastern extent of their distribution. The species requires good grass cover within their home ranges for shelter and to hide from predators, but often use steep open areas with little cover when feeding. The global population is estimated to be a minimum of 2 000 individuals in formally protected areas, but further research is needed to determine whether there are over 10 000 individuals across its range (Taylor et al, 2017). The largest known subpopulations occur in the Maloti-Drakensberg Park World Heritage Site, where numbers were estimated to be 2 000-3 000 in 1994, but which are thought to have declined by at least 15-20%. The primary threat is suspected to be increased levels of bushmeat and illegal sport hunting with dogs. Habitat degradation is a further threat, either due to climate-change or land-use change (Taylor et al, 2017). This species is protected by provincial legislation.

Poecilogale albinucha (African Striped Weasel) is widely distributed throughout sub-saharan Africa and ranges from southwestern Uganda and Kenya to the Western Cape in South Africa. It is regarded as rare to uncommon, with highest densities reached in moist higher rainfall grasslands (Stuart et al, 2015). There are no major threats to the species, but it is hunted for use in traditional medicines.

FIELD ASSESSMENT

The following section provides the results from the field survey for the proposed development that was undertaken during February 2022.

FORMICIDE

Ten (10) species of Formicidae, representing two sub-families, were recorded within the PAOI (**Table 6-13**; **Figure 6-16**). Considering that only active sampling was utilised during the survey period, it is highly likely that there are species present within the PAOI that would have not been recorded during the field survey. The ecological condition of the PAOI was not regarded as natural due to the prevalence of the graminoids *Tenaxia disticha* (Mountain Wire Grass) and *Tenaxia stricta* (Bokbaardgras), sub-climax species that indicate over-grazing. Nevertheless, in consideration that a relatively species rich Formicidae assemblage was recorded using only active methods, and that the community is not dominated by a single or few species, denotes that the ecological condition within the PAOI is near-natural.

The Formicidae community within the PAOI and proximal landscape are vital biotic ecosystem components. A single Myrmicinae species, *Anoplolepis custodiens*, is regarded as possibly critical for maintaining the wellbeing of the vegetation as they are distributors of myrmecochorous seeds. Moreover, significantly more seedlings germinate on

Messor capensis nest-mounds than in inter-mound spaces. A portion of the species recorded are aggressive predators and therefore, likely aid in control of possible pest species.

Table 6-13: Summary of Formicidae recorded within the proposed Esizayo WEF PAOI

SUB-FAMILY	SCIENTIFIC NAME	COMMON NAME	ECOLOGY
Formicinae	*Anoplolepis custodiens*	Large Pugnacious Ant	An aggressive and voracious predator consuming an array of prey items. Distributor of myrmecochorous seeds. Tend to homopterans.
Formicinae	*Anoplolepis steingroeveri*	Small Pugnacious Ant	An aggressive and voracious predator consuming an array of prey items.
Formicinae	*Camponotus maculatus*	Spotted Sugar Ant	Widely distributed with many subspecies but taxonomy needs to be revised. Nocturnal foragers.
Formicinae	*Camponotus mystaceus*	Moustached Sugar Ant	Found in a range of habitats. Limited ecological information known.
Formicinae	*Lepisiota capensis*	Small Black Sugar Ant	Widely distributed species. Tend to homopterans. There are several known super-colonies in southern Africa and have been known to displace the invasive *Linepithema humile* (Argentinian Ant).
Myrmicinae	*Meranoplus peringueyi*	Furry Cautious Ant	Based on locality and habitat data, it is postulated that this species requires natural habitats and is intolerant to heavily degraded and transformed areas. There is limited ecological information available.
Myrmicinae	*Messor capensis*	Common Harvester Ant	Granivorous species that is a distributor of myrmecochorous seeds. Nests are built directly into the ground with considerable mounds of sand excavated and may thus be important in capturing surface runoff in congruency with termite mounds.
Myrmicinae	*Monomorium sp.*	Timid Ant	The species within this genus are predators and general scavengers. Tend to homopterans.
Myrmicinae	*Pheidole capensis*	Brown House Ant	The genus is widespread and ecologically dominant. *Pheidole* are general scavengers and predators, feeding on a wide range of prey. *P. capensis* are harvesters and granivorous and may play a role in the distribution of some small-seeded plants.

Figure 6-16: Photographs illustrating a portion of the Formicidae species recorded within the within the proposed Esizayo WEF Expansion Area PAOI. A) Pheidole capensis modestior, B) Messor capensis, C) Lepisiota capensis, D) Anoplolepis steingroeveri, E) Anoplolepis custodiens and F) Meranoplus peringueyi

AMPHIBIANS

Four (4) amphibian species were recorded within the PAOI and proximal landscape during the survey period (**Table 6-14**; **Figure 6-17**). None of the species recorded are regarded as being of conservation concern, albeit all are protected under provincial legislation. While species such as *Amietia poyntoni* and *Xenopus laevis* are dependent on permanent water sources, they are tolerant of anthropogenic environments and therefore able to occupy the farm dams located within the PAOI. Notably, seasonal rainfall that occurred during the survey period triggered activity of the amphibian species observed. Based on the habitat present within the PAOI, all of the expected species are likely to occur within it.

Table 6-14: Summary of amphibian species recorded within the proposed Esizayo WEF Expansion Area PAOI and proximal landscape during the survey period

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		ENDEMINSM
			REGIONAL	GLOBAL	
Bufonidae	*Vandijkophrynus gariepensis*	Karoo Toad	LC	LC	Endemic
Pipidae	*Xenopus laevis*	Common Platanna	LC	LC	-
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	LC	LC	Endemic
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	LC	LC	Endemic

LC = Least Concern

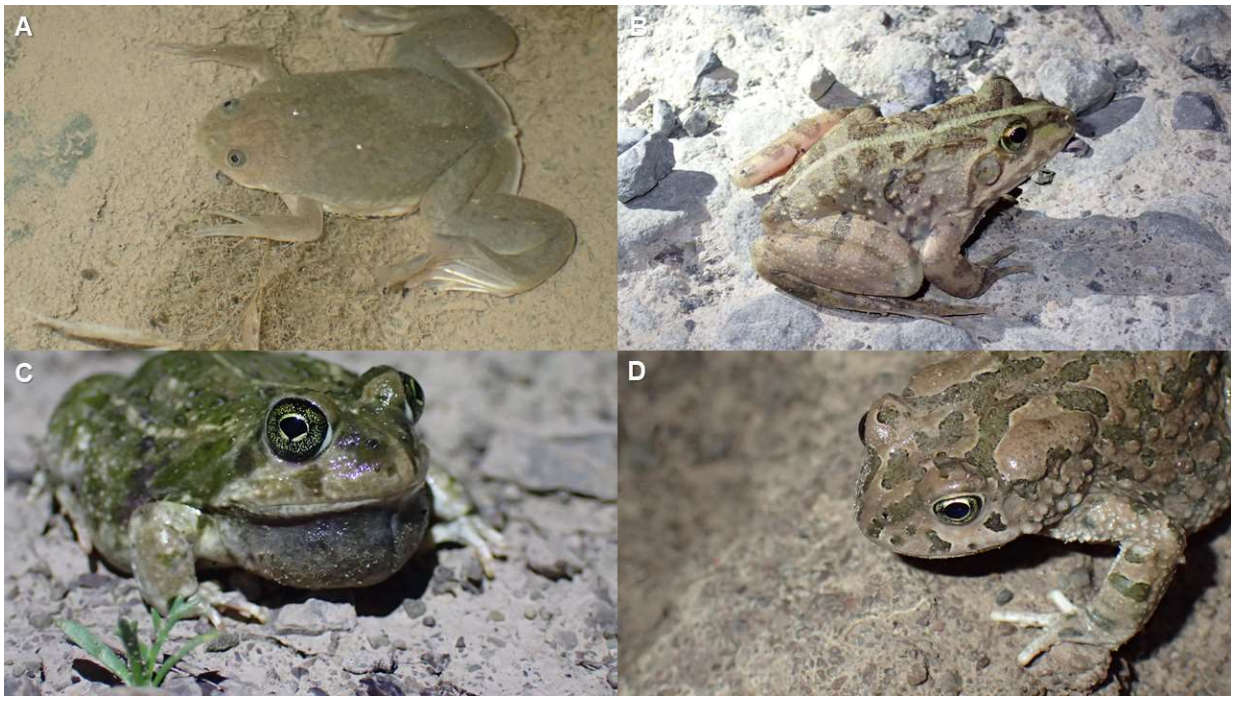


Figure 6-17: Photographs illustrating individuals of the amphibian species recorded within the proposed Esizayo WEF Expansion Area PAOI and proximal landscape during the survey period. A) *Xenopus laevis*, B) *Amietia poyntoni*, C) *Tomopterna delalandii* and D) *Vandijkophrynus gariepensis*

REPTILES

Seven (7) species of reptile were recorded within the assessment area during the survey period, accounting for approximately 12% of the expected species (**Table 6-15**; **Figure 6-18**). Based on the extent and diversity of fine-scale habitats within the PAOI, it is likely to support a diverse assemblage of reptiles. The lack of species diversity recorded during the field survey is due to the secretive behaviour of many species and therefore, extensive survey periods are required to obtain an accurate representative sample. This is congruent with the findings of previous ecological assessments within the landscape. A single SCC was recorded during the survey period, namely *Chersobius boulengeri* (Karoo Dwarf Tortoise). It is important to note that previous studies had indicated the species to be NT but the latest assessment has listed it as EN due to a 50% loss of habitat and previously existing subpopulations are no longer viable or have been extirpated.

Table 6-15: Summary of reptile species recorded within the proposed Esizayo WEF Expansion Area PAOI during the survey period. Species of Conservation Concern are highlighted in bold.

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		ENDEMINSM
			REGIONAL	GLOBAL	
Agamidae	*Agama atra*	Southern Rock Agama	LC	LC	
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	LC	LC	Near-endemic
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand Lizard	LC	LC	
Pelomedusidae	*Pelomedusa galeata*	Cape Terrapin	LC	LC	Near-endemic

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		ENDEMINSM
			REGIONAL	GLOBAL	
Scincidae	*Trachylepis variegata*	Variegated Skink	LC	LC	
Testudinidae	*Chersina angulata*	Angulate Tortoise	LC	LC	Near-endemic
Testudinidae	***Chersobius boulengeri***	**Karoo Dwarf Tortoise**	**EN**	**EN**	**Endemic**

EN = Endangered and LC = Least Concern

C. boulengeri has a limited distribution and can be regarded as a Karoo endemic or near endemic as it peripherally occurs within the Albany Thicket biome within the south-east of its distribution range (Hofmeyer et al, 2018a) (**Figure 6-19**). The species typically occupies dolerite ridges and rocky outcrops at altitudes between 800 and 1 500 m above sea level. They usually take shelter under rocks in vegetated areas or in rock crevices, but few rocky sites over the range offer suitable retreats for the species (Hofmeyr et al, 2018a). The elevation data for each turbine within the proposed WEF was plotted against the species' preferred elevation range (**Figure 6-20**). Elevation data for each turbine was extracted using an Aster Digital Elevation Model (https://earthexplorer.usgs.gov). There is a distinctive overlap between the species' preferred elevation range and the altitudinal position of each wind turbine, thereby postulating a direct impact to the local population. Apart from the concern of direct habitat loss, a further impact observed within the PAOI was the increase in Pied Crow activity due to anthropogenic structures within the surrounding landscape. All individuals of the *C. boulengeri* recorded within the PAOI were observed to have been predated by these crows as evidenced by the manner in which the shells had been broken.

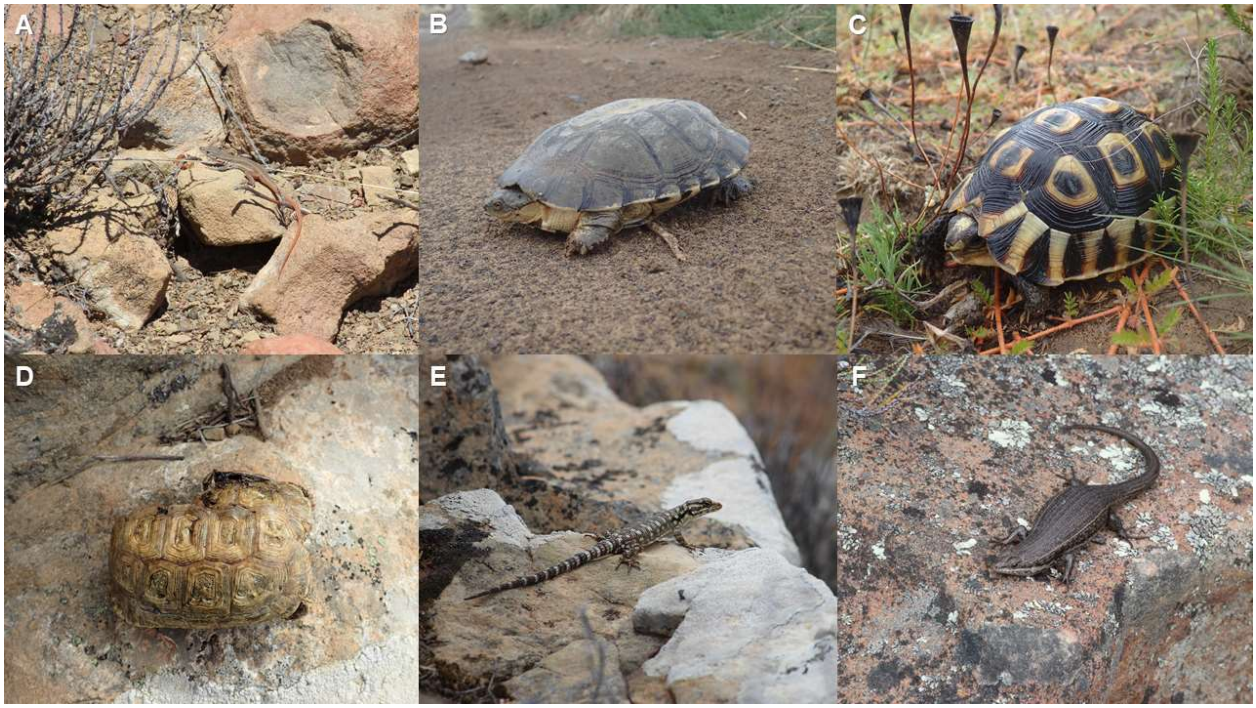


Figure 6-18: Photographs illustrating individuals of the reptile species recorded within the proposed Esizayo WEF Expansion Area PAOI during the survey period. A) *Naja nivea* (Cape Cobra) and B) *Pedioplanis inornata* (Western Sand Lizard)

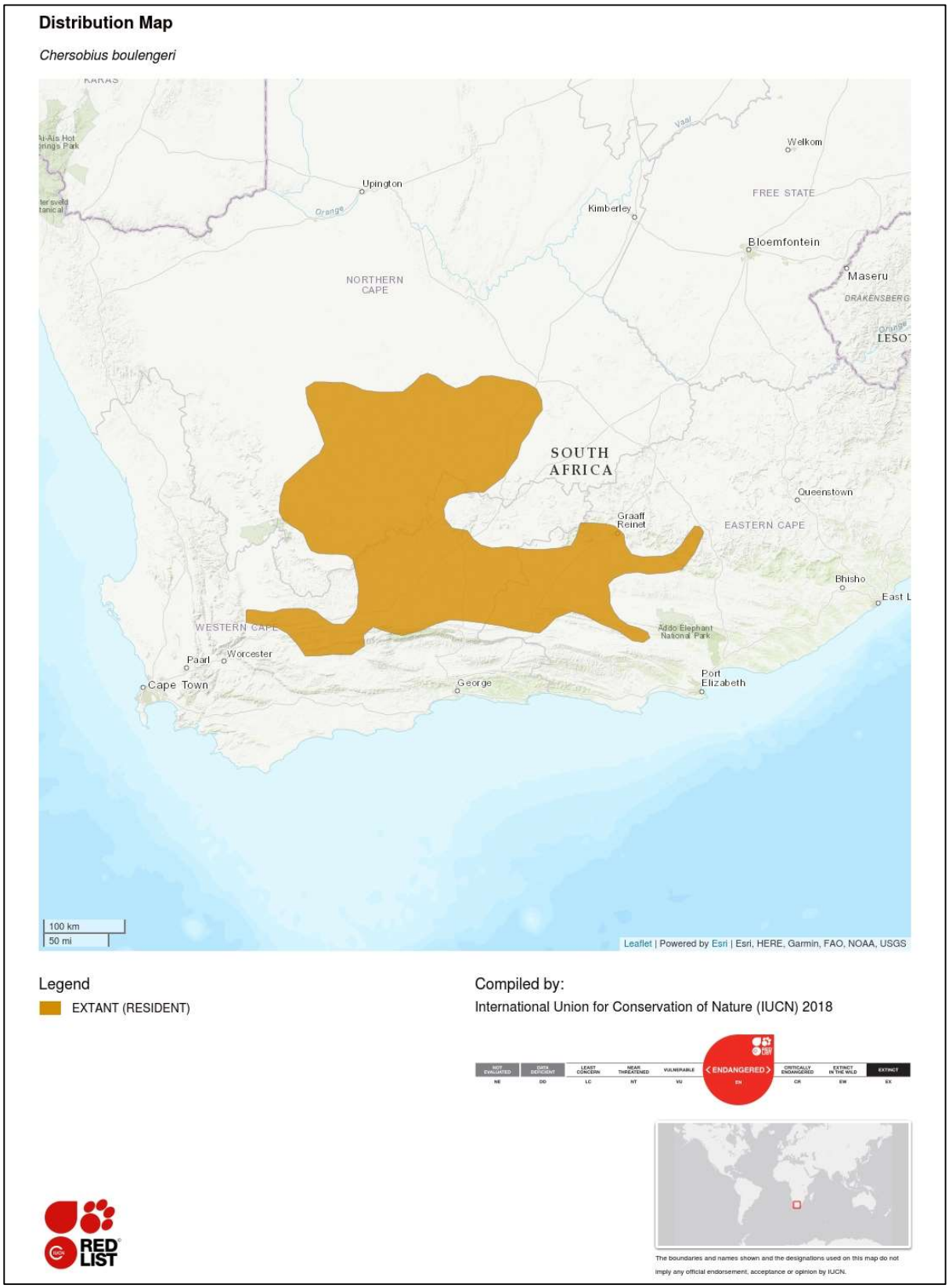


Figure 6-19: Map illustrating the distribution of *Chersobius boulengeri* (Karoo Dwarf Tortoise) (Source: Hofmeyer et al., 2018a)

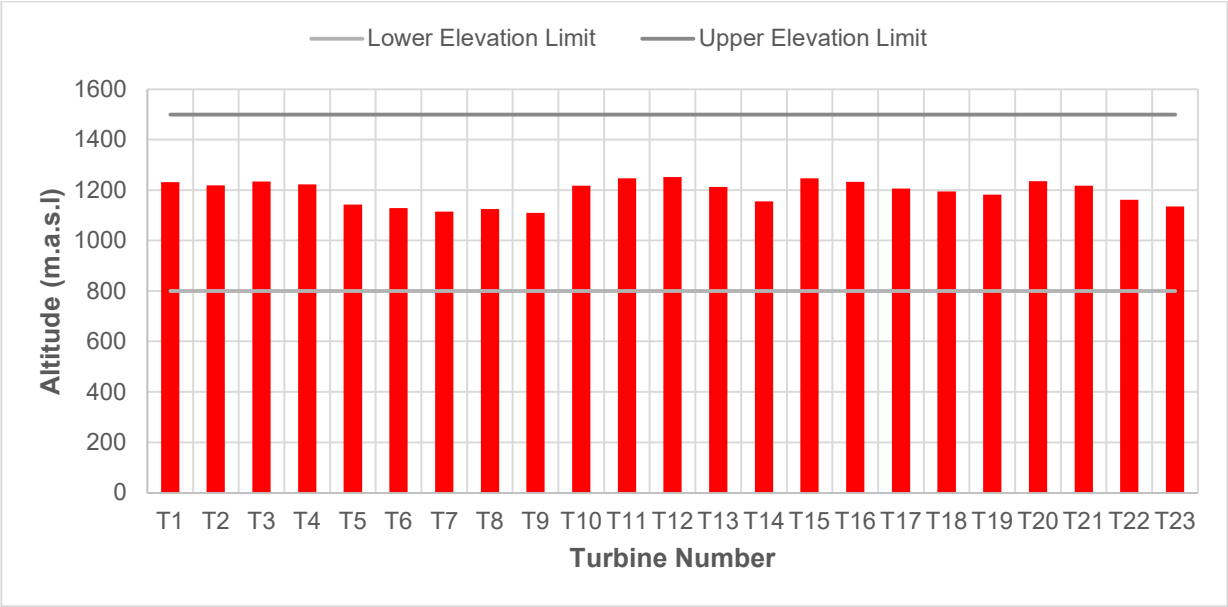


Figure 6-20: Line and column plot illustrating the altitude of the proposed Esizayo WEF wind turbines in relation to the lower and upper elevation distribution limits of *Chersobius boulengeri* (Karoo Dwarf Tortoise)

MAMMALS

Twenty-four (24) non-volant mammal species were recorded during the survey based on either direct observation, capture of specimens by passive sampling techniques or the presence of tracks and other signs (**Table 6-16; Figure 6-21**). This accounts for approximately 50% of the expected species. Two of the species recorded, *Graphiurus ocularis* (Spectacled Dormouse) and *Pelea capreolus* (Grey Rhebok), are regarded as a SCC as they are listed as NT on either a global or regional scale. See section 3.1.3.3 of this report for further information pertaining to the ecology and conservation of these species. *G. ocularis* were recorded within dolerite outcrops on steep rocky slopes as well as in drainage lines, due to the consolidated nature of the substrate and cavities available. P. capreolus tend to occur within higher elevations, albeit it is likely to utilise the entire area in response to seasonal plant growth.

Many are considered important in maintaining biodiversity and ecosystem functioning. *Orycteropus afer* (Southern Aardvark) is regarded as an ecosystem engineer and the burrows it creates are also utilised as shelter by an array of faunal species, which is pertinent in the thermally variable and arid environment of the project area (Haussmann et al, 2018; Whittington-Jones et al, 2011). Typically, maximum temperatures are significantly lower and minimum temperatures and relative humidity values significantly higher inside burrows than outside (Whittington-Jones et al, 2011). Active burrows tend to possess a lower species richness of flora in comparison to surrounding areas, due to the constant trampling and excavating, however, flora species richness is higher at disused burrows than surrounding areas (Haussmann et al, 2018). This is attributed to the higher seedling survival due to the micro-habitat conditions associated with disused burrows. Therefore, even the areas around the burrows are utilised by many species and can result in a highly diverse arthropod community.

The PAOI and proximal landscape also supports a relatively species rich assemblage of mesocarnivores. Mesocarnivores have strong effects on their prey species, and this especially so in simple ecological communities or in regions where apex predators are lacking (Roemer et al, 2009). Consequently, shifts in the population or diversity of the mesocarnivore community may lead to trophic cascade effects.

Table 6-16: Summary mammal species recorded within the proposed Esizayo WEF Expansion Area PAOI and proximal landscape during the survey period

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	
			REGIONAL	GLOBAL
Bathyergidae	*Cryptomys hottentotus*	Common Mole-rat	LC	LC
Bovidae	*Antidorcas marsupialis*	Karoo Springbok	LC	LC
Bovidae	*Oreotragus*	Cape Klipspringer	LC	LC
Bovidae	*Pelea capreolus*	Grey Rhebok	NT	NT
Bovidae	*Raphicerus campestris*	Southern Steenbok	LC	LC
Canidae	*Lupulella mesomelas*	Black-backed Jackal	LC	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox	LC	LC
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC	LC
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	NT	LC
Herpestidae	*Atilax paludinosus*	Water Mongoose	LC	LC
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC	LC
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	LC	LC
Hystricidae	*Hystrix africaeaustralis*	Southern Porcupine	LC	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC
Leporidae	*Pronolagus saundersiae*	Hewitt's Red Rock Rabbit	LC	LC
Macroscelididae	*Elephantulus edwardii*	Cape Rock Sengi	LC	LC
Macroscelididae	*Macroscelides proboscideus*	Karoo Round-eared Sengi	LC	LC
Muridae	*Gerbilliscus afra*	Cape Gerbil	LC	LC
Muridae	*Micaelamys namaquensis*	Namaqua Rock Rat	LC	LC
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Mouse	LC	LC
Muridae	*Steatomys krebsii*	Kreb's African Fat Mouse	LC	LC

FAMILY	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	
			REGIONAL	GLOBAL
Nesomyidae	*Malacothrix typica*	Gerbil Mouse	LC	LC
Orycteropodidae	*Orycteropus afer*	Southern Aardvark	LC	LC
Procaviidae	*Procavia capensis*	Rock Hyrax	LC	LC

LC = Least Concern and NT = Near Threatened

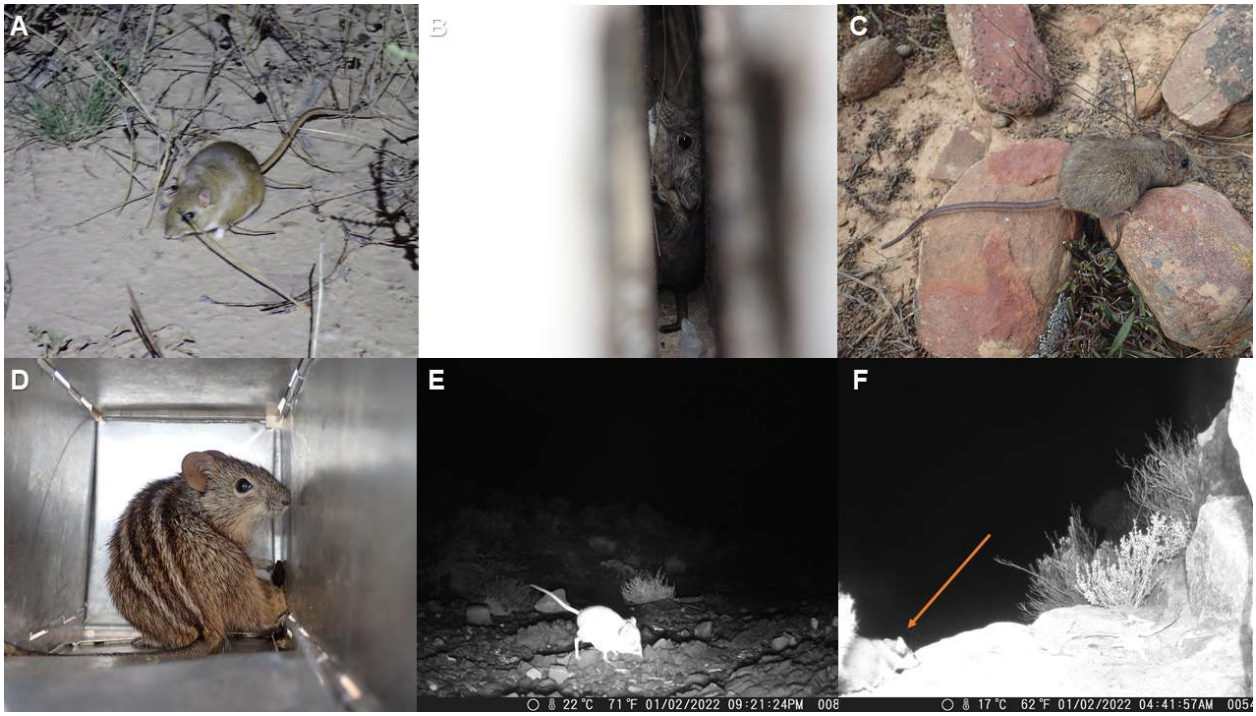


Figure 6-21: Photographs illustrating a portion of the mammal species recorded within the proposed Esizayo WEF Expansion Area PAOI during the survey period. A) *Gerbilliscus afer* (Cape Gerbil), B) *Elephantulus edwardii* (Cape Rock Sengi), C) *Micaelamys namaquensis* (Namaqua Rock Rat), D) *Rhabdomys pumilio* (Xeric Four-striped Mouse), E) *Macroscelides proboscideus* (Karoo Round-eared Sengi) and F) *Graphiurus ocularis* (Spectacled Dormouse)

6.1.11 HABITATS AND SITE ECOLOGICAL IMPORTANCE

HABITAT ASSESSMENT

The habitat structure within the PAOI was heterogenous, with distinctive variability. Five habitat types were delineated within the PAOI, namely Valley Bottom Plains, Drainage Lines, Moderately Steep Rocky Slopes, Steep Rocky Slopes, and Plateaus. With the exception of drainage lines, these habitats were delineated based on the interaction between elevation and slope (**Table 6-17, Figure 6-22**). However, these habitats were not distributed disjointedly within the PAOI, and there is overlap and ecotones between them. It is important to note that dolerite extrusions were prevalent within the PAOI and were a feature of all habitats. These micro-habitats were inhabited by a distinct assemblage of flora in comparison to the surrounding habitats. Key flora are those species that generally exhibited a preference for that habitat type. Photographs illustrating habitat physiognomy are provided in **Figure 6-23.**

Table 6-17: Summary of habitat descriptions within the proposed Esizayo WEF Expansion Area PAOI

HABITAT NAME	SLOPE (DEGREES)	ELEVATION (CATEGORICAL POSITION IN LANDSCAPE)	KEY FLORA
Plain	0.01 – 19.78	Lowest	*Pentzia incana* *Lycium Schizocalyx* *Hermannia cueneifolia*
Plateau	0.01 – 19.78	Upper	*Ruschia intricata* *Pentzia incana* *Elytropappus rhinocerotis* *Ruschia punctulata*
Moderately Steep Rocky Slope	19.78 – 39.55	Low - Mid	*Euryops lateriflorus* *Ruschia intricata* *Antimima pumila* *Crassula columnaris*
Steep Rocky Slope	39.55 – 59.33	Mid - Upper	*Pentzia incana* *Ruschia intricata* *Antimima* spp.
Drainage Line	Varied	Varied	*Cyperus marginatus* *Gnidia scabra* *Selago fourcadei* *Afroscirpoides dioeca*
Dolerite Extrusion	Varied	Varied	*Felicia filifolia* *Crassula subaphylla* *Crassula deltoidea* *Crassula tomentosa* *Pelargonium carnosum*

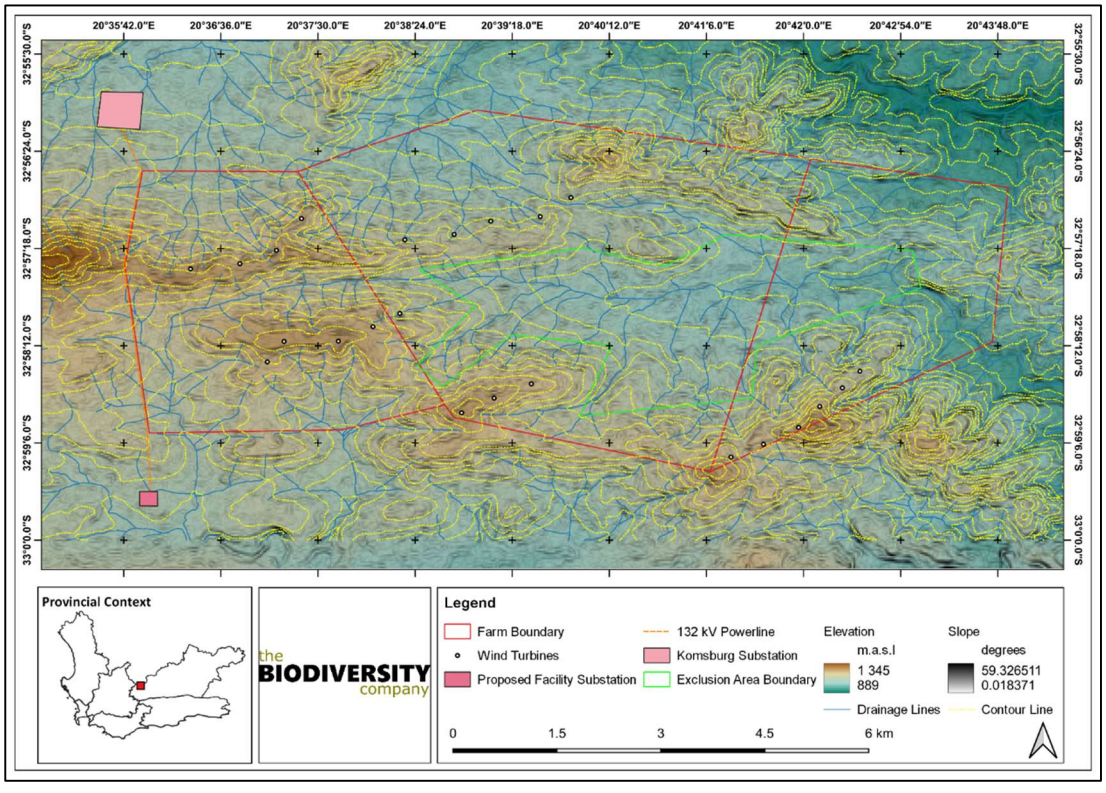


Figure 6-22: Map illustrating the location and extent of habitat types delineated within the proposed Esizayo WEF Expansion Area PAOI (Source: The Biodiversity Company, 2021)

Figure 6-23: Photograph illustrating an overview of the habitat physiognomy within the proposed Esizayo WEF Expansion Area PAOI. A) Drainage Line, B) Plateau, C) Plateau (foreground) and a Moderately Steep Rocky Slope leading to a Dolerite Extrusion (Background) and D) Moderately Steep Rocky Slope (foreground) and Steep Rocky Slopes (background)

6.1.12 BATS

The bat assessment was undertaken by The Biodiversity Company with input from Inkululeko Wildlife Services (Pty) Ltd. The bat assessment is included in the Biodiversity Report included as ***Appendix F2.***

The assessment includes preliminary results from the first two of six additional months of pre-construction bat monitoring. The additional monitoring is required because the original 12-month pre-construction bat monitoring study by Animalia (2016) expired in November 2021, and also because the developer now intends to increase the proposed turbine dimensions and to expand the WEF northwards.

Vegetation units and geology are of great importance as these may serve as suitable sites for the roosting of bats and support of their foraging habits (Monadjem et al. 2010). Houses and buildings may also serve as suitable roosting spaces (Taylor 2000; Monadjem et al. 2010). The importance of the vegetation units and associated geomorphology serving as potential roosting and foraging sites have been described in **Table 6-18**.

Table 6-18: Potential of the vegetation to serve as suitable roosting and foraging spaces for bats

VEGETATION UNIT	ROOSTING POTENTIAL	FORAGING POTENTIAL	COMMENTS
Central Mountain Shale Renosterveld	Moderate - High	Moderate - High	The mountain ridges, slopes and escarpments provide a wide variety of landscape features to enable the successful roosting and foraging of several insectivorous bat species.
Koedoesberge-Moordenaars Karoo	Moderate - High	Moderate	The landscape features provide roosting space for bat species inhabiting rock crevices and caverns. The shrub

VEGETATION UNIT	ROOSTING POTENTIAL	FORAGING POTENTIAL	COMMENTS
			vegetation provides a foraging niche which can be filled by clutter-edge and open air foraging bat species.

"Probability of Occurrence" is assigned based on consideration of the presence of roosting sites and foraging habitats on the site, compared to literature described preferences. The probability of occurrence is indicative of the likelihood of encountering the bat species on site. **Table 6-19** lists the species that are confirmed to be roosting or foraging on the study area.

The column of "Likely risk of impact" describes the likelihood of risk of fatality from direct collision or barotrauma with wind turbine blades for each bat species. The risk was assigned by Sowler and Stoffberg (2014) based on species distributions, altitudes at which they fly and distances they traverse; and assumes a 100% probability of occurrence.

There are several bat species in the vicinity of the site that occur commonly in the area. These species are of importance based on their likelihood of being impacted by the proposed WEF, due to high abundances and certain behavioural traits. The most relevant species include:

- *Tadarida aegyptiaca*, the Egyptian Free-tailed Bat, is a Least Concern species as it has a wide distribution and high abundance throughout South Africa, and is part of the Free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique (Monadjem et al. 2010). This species is protected by national legislation in South Africa (ACR 2010).
- *Laephotis capensis* is commonly called the Cape serotine and has a conservation status of Least Concern as it is found in high numbers and is widespread over much of Sub-Saharan Africa.
- *Miniopterus natalensis*, also commonly referred to as the Natal long-fingered bat, occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened (Monadjem et al., 2010). This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation.

Table 6-19: Table of Species that are roosting or foraging in Esizayo Study Area

SPECIES	COMMON NAME	PROBABILITY OF OCCURRENCE	CONSERVATION STATUS	POSSIBLE ROOSTING HABITAT ON SITE	POSSIBLE ROOSTING HABITAT UTILIZED ON SITE	LIKELIHOOD OF RISK OF FATALITY
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed	Least Concern	Caves, rock crevices, under exfoliating rocks, in hollow trees, and behind the bark of dead trees	Open-air forager	High
Sauromys petrophilus	Robert's flat-headed bat	90-100%	Least Concern	Narrow cracks and slabs of exfoliating rock. Rocky habitat in dry woodland, mountain fynbos or arid scrub.	Open-air forager	High
Miniopterus natalensis	Natal long-fingered bat	Confirmed	Near Threatened	Cave and hollow	Clutter-edge forager	Medium - High

SPECIES	COMMON NAME	PROBABILITY OF OCCURRENCE	CONSERVATION STATUS	POSSIBLE ROOSTING HABITAT ON SITE	POSSIBLE ROOSTING HABITAT UTILIZED ON SITE	LIKELIHOOD OF RISK OF FATALITY
				dependent, but forage abroad. Also, take refuge in culverts and vertical hollows, holes.		
Eptesicus hottentotus	Long-tailed serotine	Confirmed	Least Concern	Roosts in rock crevices	Clutter-edge forager	Medium - High
Laephotis capensis	Cape serotine	Confirmed	Least Concern	Roosts under the bark of trees and under roofs of houses.	Clutter-edge forager	Medium - High

PRELIMINARY MONITORING RESULTS

For the current IWS monitoring study, passive acoustic recording of bat call activity was performed using Wildlife Acoustics SongMeter 4 bat (SM2BAT) detectors and SMM-U2 microphones at two locations referred to as bat monitoring stations ES1 and ES2 (**Figure 6-24**). ES1 is located on the onsite 80 m meteorological (met.) mast, and comprises one detector connected to a microphone installed at 80 m above ground level (a.g.l.), and another detector connected to a microphone installed at 10 m a.g.l. ES2 comprises a portable 10 m mast whereon a detector is connected to a microphone installed at approximately 9.5 m a.g.l. The bat call data that have been recorded to date were processed and analyzed using Wildlife Acoustic's Kaleidoscope, Titley Scientific's Analook, and MicroSoft's Excel software programmes. Aside from a visual appraisal of onsite habitats and features of potential importance for bats, no other bat sampling work was performed or is considered necessary.

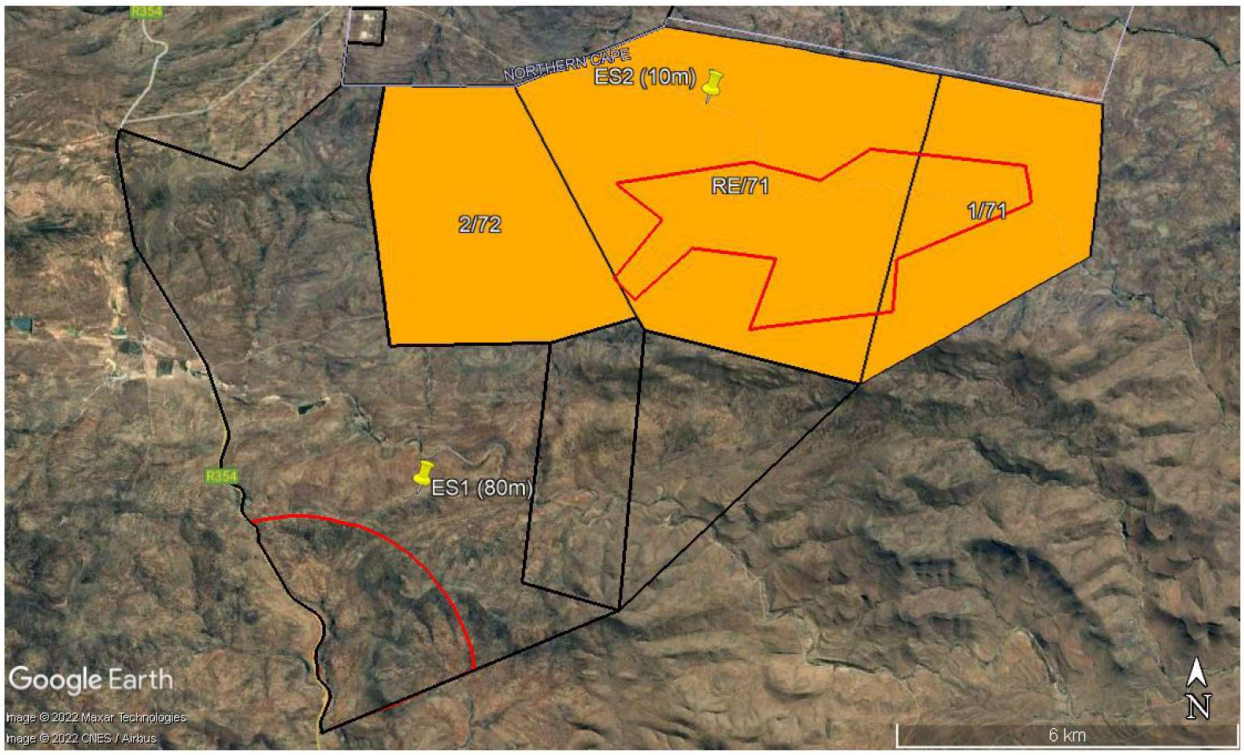


Figure 6-24: The locations of bat monitoring stations ES1 and ES2 within the original (clear) and new (orange) farm portions comprising the proposed Esizayo WEF site. Areas which will be excluded from development of the WEF are outlined in red

BAT SPECIES COMPOSITION AT DIFFERENT HEIGHTS AND LOCALITIES

During the sampled summer period (late November 2021 to late January 2022), calls were recorded at ES1 and ES2 from four bat species, namely the Egyptian Free-tailed Bat (Tadarida aegyptiaca), Cape Serotine (Laephotis capensis), Long-tailed Serotine (Eptesicus hottentotus), and the Natal Long-fingered Bat (Miniopterus natalensis). The same four bat species were recorded onsite by Animalia (2016).

The Egyptian Free-tailed Bat was the dominant species in turbine rotor sweep height, with almost 100% of recorded calls made by this species at 80 m a.g.l. The same finding was reported by Animalia (2016), and suggests that during operation of the Esizayo WEF, Egyptian Free-tailed Bats will comprise the majority of turbine-related bat fatalities.

Near (at approximately 10 m above) ground level, the Egyptian Free-tailed Bat, Cape Serotine, Long-tailed Serotine, and Natal Long-fingered Bat were recorded in descending order of relative (call) abundance. The same finding was reported by Animalia (2016) and suggests that a greater diversity (species richness and abundance) of bats will be at risk of fatality from turbines with blades that approach closer to ground level.

BAT ACTIVITY AT DIFFERENT HEIGHTS AND LOCATIONS

Significantly less bat activity was recorded in turbine rotor sweep height compared to near ground level. This is typical in most parts of South Africa (MacEwan et al. 2020). At ES1 80 m, an average of 29 bat passes (bp) per night (or 3 bp per hour) was recorded. At ES1 10 m, an average of 59 bp / night (6 bp / h) was recorded, and together at ES1 and ES2 10 m, an average of 85 bp per night (9 bp per hour) was recorded. In comparison, Animalia (2016) recorded an estimated average of 0 and 10 bp / night at 80 m and 10 m, respectively, on the met. mast. In other words, during the recent 2021/2022 summer period, at the same location, almost 30 times and six times more bat activity was recorded in rotor sweep and near ground level, than during 2015/2016.

For further comparison, at a nearby site in the same Montane fynbos and renosterveld shrubland ecoregion where IWS previously conducted monitoring, an annual average of 0 bp / h (range: 0-2 bp/h) in rotor sweep and 1 bp / h (range: 1-4 bp / h) near ground level was recorded (MacEwan et al. 2020). Therefore, it appears that the recently recorded levels of onsite bat activity are above average for the area. At least two explanations for this are possible.

The recently recorded higher onsite bat activity may at least be partly related to good rain that was received in the region this past summer. If the rain (and an associated increase in plant growth and insect abundance) has caused a widespread increase in bat activity, this could explain recent reports of sudden high bat fatalities at several operational wind farms in the broader region (SABAA pers. comm. February 2022; IWS unpubl. data). These findings highlight how dramatically bat activity may vary at a given location between years, and why adaptive management of bat fatalities (including potential sudden mass mortality events) is crucial during WEF operation.

Alternatively, or in addition, the recorded higher bat activity may be due to differences between the SM3BAT and SMM-U1 microphones used by Animalia (2016), and the SM4BAT and SMM-U2 microphones that are being used for the current monitoring. Testing by IWS (unpubl. data) has indicated that SMM-U2 microphones may detect approximately 1.34 times more bat passes than SMM-U1 microphones - when connected to a SM3BAT detector. IWS had not yet had the opportunity to compare these microphones when connected to a SM4BAT detector. Significantly more bat activity could be recorded by a SM4BAT detector connected to a SMM-U2 microphone, compared to a SM3BAT detector connected to a SMM-U1 microphone. If a correction factor of at least 1.34 is applied to the recent data from site, the average levels of bat activity recorded in rotor sweep and near ground level remain above average for the area.

Almost twice as much activity was recorded at ES2 10 m, compared to ES1 10 m - for the four bat species considered collectively, and separately. The higher bat activity at ES2 is potentially explained by its closer proximity to a drainage line. Animalia (2016) reported, similarly, that in comparison to Animalia's "Short Mast 1," the higher recorded near ground bat activity at "Short Mast 2" was "most likely due to its location near the river on site." WEF development should avoid such areas with known or anticipated high bat activity - based on the reasonable assumption (and growing evidence in South Africa; IWS unpubl. data) that there is a positive relationship between bat activity and bat fatalities at WEFs

6.1.13 AVIFAUNA

The following is extracted from the Avifauna Impact Assessment compiled by Chris van Rooyen and included as ***Appendix F1****.*

BIOMES AND VEGETATION TYPES

The proposed Esizayo Expansion WEF is situated approximately 25km north of the town of Matjiesfontein in the Western Cape Province. The habitat in the development site is rugged, consisting of rolling hills with boulder-strewn slopes and exposed ridge lines, and is bisected by a few ephemeral drainage lines. The development site contains a number of man-made dams used for the irrigation of a few crops (mostly pastures), which is grown as supplementary fodder for small stock farming. Sheep farming is the main economic activity. Eskom's Droërivier-Kappa 2 400kV, Bacchus-Droërivier 1400kV and Gamma Kappa 1 765 kV transmission lines and Komsberg Substation are located just the north of the development site.

The natural vegetation at the site is dominated by Central Mountain Shale Renosterveld which exists in a transitional zone between the Fynbos and Succulent Karoo Biomes (Mucina & Rutherford 2006). The vegetation type is found on slopes and broad ridges of low mountains and escarpments. It consists of tall shrubland dominated by renosterbos and large suites of mainly non-succulent karoo shrubs with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats (Mucina & Rutherford 2006). In the east the Central Mountain Shale Renosterveld is replaced by Koedoesberge – Moordenaars Karoo which is found on slightly undulating to hilly landscapes consisting of low succulent scrub and dotted by scattered tall shrubs and patches of "white" grass (Mucina & Rutherford 2006).

The climate is arid to semi-arid with a mean average precipitation of 219 mm, most of which takes place between March and September. Mean daily maximum and minimum temperatures in Laingsburg range between 29°C and 2°C for February and July (http://www.worldweatheronline.com/laingsburg-weather-averages/northern-cape/za.aspx).

Whilst the distribution and abundance of the bird species in the development site and immediate surrounding environment are typical of the broad vegetation type, it is also necessary to examine bird habitats in more detail as it may influence the distribution and behaviour of priority species. These are discussed in more detail below.

BIRD HABITATS

RENOSTERVELD

The Fynbos biome is dominated by low shrubs and has two major vegetation divisions: fynbos proper, characterised by restioid, erioid and proteoid components; and renosterveld, dominated by *Asteraceae*, specifically *Renosterbos Elytropappus rhinocerotis*, with geophytes and some grasses. Renosterveld, unlike fynbos, extend into the karoo shales, where rainfall patterns allow a high grass cover and abundance of non-succulent shrubs. Shale renosterveld shows strong affinities with neighbouring succulent Karoo vegetation (Mucina & Rutherford 2006). This biome is characterised by a high level of diversity and endemism in its botanical composition, which is not paralleled in its terrestrial avifauna, which is depauperate relative to other southern African biomes (Harrison et al. 1997). The following priority species could utilise the renosterveld in the development area:

- Black Harrier
- Black-winged Kite
- Common Buzzard
- Greater Kestrel
- Grey-winged Francolin
- Jackal Buzzard
- Karoo Korhaan
- Lanner Falcon
- Lesser Kestrel
- Ludwig's Bustard
- Martial Eagle
- Pale Chanting Goshawk
- Secretarybird
- Southern Black Korhaan
- Spotted Eagle-Owl

SURFACE WATER

Man-made impoundments, although artificial in nature, can be very important for a variety of birds, particularly water birds. Apart from the water quality, the structure of the dam, and specifically the margins and the associated shoreline and vegetation, plays a big role in determining the species that will be attracted to the dam. The development site contains a few dams in drainage lines which could attract numbers of waterbirds in wet years. There are also a few ephemeral drainage lines in the development site which flows after good rains and could hold pools of water for weeks at a time in the rainy season, a few boreholes with water troughs. The following priority species could utilise sources of surface water in the development area:

- African Harrier-Hawk
- Black Harrier
- Black Stork
- Booted Eagle
- Common Buzzard
- Greater Flamingo
- Jackal Buzzard
- Lanner Falcon
- Martial Eagle
- Pale Chanting Goshawk
- Secretarybird
- Verreaux's Eagle

RIDGES, CLIFFS AND ROCKY OUTCROPS

Steep terrain is another identified habitat within the project area. Ridges are potentially important roosting, breeding and foraging habitat for a variety of priority species. The following priority species could utilise this habitat at the development area:

- African Harrier-Hawk
- African Rock Pipit
- Black Stork
- Booted Eagle
- Jackal Buzzard
- Lanner Falcon
- Spotted Eagle-Owl
- Verreaux's Eagle

CULTIVATED LANDS

Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten by birds or attract insects which are in turn eaten by birds. Relevant to this study, pastures grown as supplementary fodder for small stock farming occur within the development site and are likely draw cards for several priority species. The following priority species could utilise this habitat at the development area:

- Black-winged Kite
- Common Buzzard
- Jackal Buzzard
- Lanner Falcon
- Lesser Kestrel
- Ludwig's Bustard

EXOTIC TREES

Although stands of Eucalyptus are strictly speaking invader species, they have become important refuges for certain species of raptors which will commonly roost and breed in stands of Eucalyptus. The following priority species could utilise this habitat at the development area:

- African Harrier-Hawk
- Black-winged Kite
- Booted Eagle
- Common Buzzard
- Greater Kestrel
- Jackal Buzzard
- Lanner Falcon
- Lesser Kestrel
- Martial Eagle
- Pale Chanting Goshawk
- Rufous-breasted Sparrowhawk
- Secretarybird
- Spotted Eagle-Owl
- Verreaux's Eagle

Eskom power line pylons/towers are regularly used as roosting, hunting and/or nesting habitat by certain species. The Droërivier-Kappa 2 400kV, Bacchus-Droërivier 1400kV and Gamma Kappa 1 765 kV transmission lines that run along the northern border of the development site are utilised for breeding by Martial Eagle further to the west beyond the impact zone of the proposed WEF. The following priority species could utilise this habitat at the development area:

- Black-winged Kite
- Booted Eagle
- Common Buzzard
- Greater Kestrel
- Jackal Buzzard
- Lanner Falcon
- Lesser Kestrel
- Martial Eagle
- Pale Chanting Goshawk
- Rufous-breasted Sparrowhawk
- Verreaux's Eagle

IMPORTANT BIRD AREAS

There are no Important Bird Areas (IBA) within the confines of the development area. The closest IBA (Anysberg Nature Reserve) is located a 35km south of the proposed development site. It is therefore highly unlikely that the proposed WEF will have a negative impact on the IBAs within the broader area. The avifauna in this protected area is not expected to be impacted by the proposed WEF development, due to the distance from the project sites.

AVIFAUNA IN THE DEVELOPMENT SITE

It is estimated that a total of 140 bird species could potentially occur in the broader area of the WEF. Please refer to Appendix 3 of the specialist report (Appendix F1) which provides a comprehensive list of all the species in the broader area and the species recorded during the pre-construction monitoring. Of these, 22 species are classified as priority species for wind development. Of these 22 species, 11 have a medium to high chance of occurring at the development site.

Table 6-20 below list all the priority species and the possible impact on the respective species by the proposed WEF project.

Table 6-20: Priority species potentially occurring at the site and immediate surroundings

		SABAP2		STATUS					HABITAT							IMPACT				
SPECIES NAME	TAXONOMIC NAME	FULL PROTOCOL	AD HOC PROTOCOL	GLOBAL STATUS	SA STATUS	WIND PRIORITY	RECORDED DURING MONITORING	LIKELIHOOD OF REGULAR OCCURRENCE	RENOSTERVELD/SUCCULENT KAROO	ALIEN TREES	HIGH VOLTAGE LINES	RIDGES/CLIFFS	SURFACE WATER	AGRICULTURE	WIND COLLISION WITH TURBINES	WIND DISPLACEMENT - HABITAT TRANSFORMATION	WIND DISPLACEMENT - DISTURBANCE	POWERLINE - ELECTROCUTION MV	POWERLINE - COLLISION
African Harrier-Hawk	*Polyboroides typus*	0.00	0.00	-	-	x	x	L		x		x	x		x			x	
Black Harrier	*Circus maurus*	4.41	4.44	EN	EN	x	x	M	x				x		x			x	
Black Stork	*Ciconia nigra*	1.47	0.00	-	VU	x	x	L				x	x		x			x	x
Black-winged Kite	*Elanus caeruleus*	5.88	2.22	-	-	x	x	M	x	x	x			x	x			x	
Booted Eagle	*Hieraaetus pennatus*	2.94	4.44	-	-	x	x	M		x	x	x	x		x			x	
Common Buzzard	*Buteo*	2.94	4.44	-	-	x	x	L	x	x	x		x	x	x			x	
Greater Flamingo	*Phoenicopterus roseus*	0.00	2.22	-	NT	x		L					x		x				x
Greater Kestrel	*Falco rupicoloides*	0.00	0.00	-	-	x	x	L	x	x	x				x			x	
Grey-winged Francolin	*Scleroptila afra*	26.47	8.89	-	-	x	x	H	x						x	x	x		
Jackal Buzzard	*Buteo rufofuscus*	29.41	15.56	-	-	x	x	H	x	x	x	x	x	x	x			x	
Karoo Korhaan	*Eupodotis vigorsii*	26.47	4.44	-	NT	x	x	H	x						x	x	x		x
Lanner Falcon	*Falco biarmicus*	0.00	0.00	-	VU	x	x	L	x	x	x	x	x	x	x			x	

		SABAP2		STATUS					HABITAT						IMPACT				
SPECIES NAME	TAXONOMIC NAME	FULL PROTOCOL	AD HOC PROTOCOL	GLOBAL STATUS	SA STATUS	WIND PRIORITY	RECORDED DURING MONITORING	LIKELIHOOD OF REGULAR OCCURRENCE	RENOSTERVELD/SUCCULENT KAROO	ALIEN TREES	HIGH VOLTAGE LINES	RIDGES/CLIFFS	SURFACE WATER	AGRICULTURE	WIND COLLISION WITH TURBINES	WIND DISPLACEMENT - HABITAT TRANSFORMATION	WIND DISPLACEMENT - DISTURBANCE	POWERLINE - ELECTROCUTION MV	POWERLINE - COLLISION
Lesser Kestrel	*Falco naumanni*	0.00	4.44	-	-	x	x	L	x	x	x			x	x			x	
Ludwig's Bustard	*Neotis ludwigii*	10.29	4.44	EN	EN	x	x	H	x					x	x	x	x		x
Martial Eagle	*Polemaetus bellicosus*	7.35	6.67	EN	EN	x	x	M	x	x	x		x		x			x	
Pale Chanting Goshawk	*Melierax canorus*	35.29	15.56	-	-	x	x	H	x	x	x		x		x			x	
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	2.94	0.00	-	-	x		L		x	x				x			x	
Secretarybird	*Sagittarius serpentarius*	1.47	0.00	EN	VU	x	x	L	x	x			x		x	x			x
Southern Black Korhaan	*Afrotis afra*	0.00	0.00	VU	VU	x	x	L	x						x	x	x		x
Spotted Eagle-Owl	*Bubo africanus*	13.24	2.22	-	-	x	x	M	x	x		x			x		x	x	x
Verreaux's Eagle	*Aquila verreauxii*	25.00	6.67	-	VU	x	x	H		x	x	x	x		x			x	

EN = Endangered VU = Vulnerable NT = Near Threatened H = High M = Medium L = Low

PRE-CONSTRUCTION BIRD MONITORING

The monitoring surveys were conducted at the proposed WEF site in the following time periods:

- 26 February – 06 March 2021
- 30 April – 08 May 2021
- 24 June – 08 July 2021
- 22 August – 04 September 2021
- 28 October – 04 November 2021
- 13 – 20 January 2022

The results of the transect counts are tabled in **Table 6-21** below. **Figure 6-25** below shows the spatial distribution of the priority species recorded during transect counts and incidental sightings over all four seasons.

Table 6-21: Results of the transect counts

SPECIES COMPOSITION	TURBINE SITE	CONTROL SITE
All Species	105	56
Priority Species	11	6
Non-Priority Species	94	50
Drive transects	84	28
Walk transects	7288	1080
Total	7372	1108

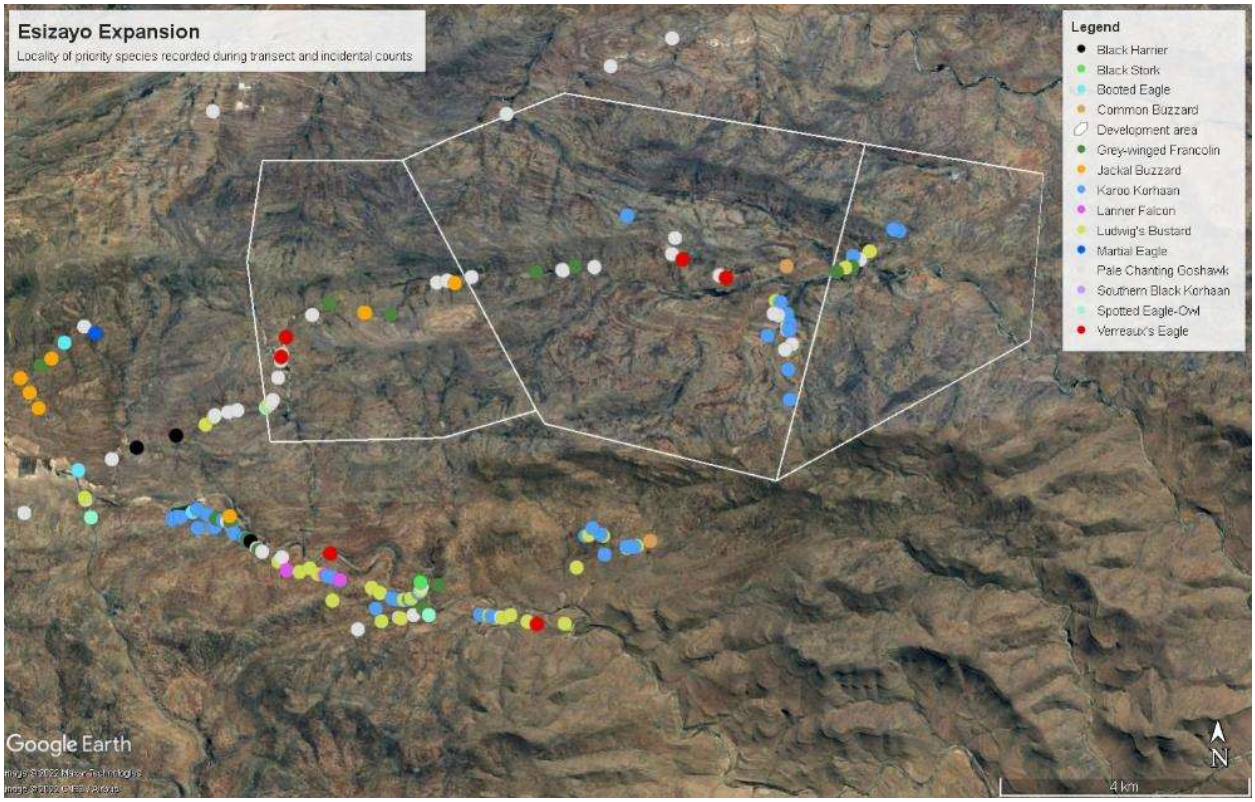


Figure 6-25: The location of priority species recorded at the proposed WEF through transect counts and incidental sightings

Nests searches were undertaken at the development site and within an 8km radius from the edge of the development site as best as possible, where access could be obtained. The nests were recorded within an 8km radius around the development site are listed in **Table 6-22** below and in **Figure 6-26**.

Table 6-22: Priority species nests recorded within an 8 km radius around the development site

NEST	DISTANCE TO CLOSEST PLANNED TURBINE	COMMENTS
Jackal Buzzard nest Aanstoot	3.11km	Not active during survey period
Verreaux's Eagle nest Wilgehout Fontein	7.81km	Active during survey period
Martial Eagle nest Standvastigheid	3.7km	Nest was in collapsed state in July 2021 when surveyed by the Endangered Wildlife Trust.
Martial Eagle nest Wolvenkop	10.35km	Nest was in moderate condition when surveyed by the Endangered Wildlife Trust in July 2021, but inactive.
Verreaux's Eagle nest Klipgat	9.32km	Pair was observed at the nest in August 2021.
Jackal Buzzard nest Klipgat	4.65km	Looks like an old nest, no fresh scat around the nest in September 2021. No birds observed.

NEST	DISTANCE TO CLOSEST PLANNED TURBINE	COMMENTS
Jackal Buzzard nest Josephskraal	5.23km	Fresh scat around the nest when visited in August 2021. No birds observed.
Verreaux's Eagle nest Aasvogelbosch	7.57km	Status uncertain

Figure 6-26: Priority species nests in the vicinity of the development area

6.2 SOCIAL AND ECONOMIC

6.2.1 SOCIAL CONTEXT

*The following is extracted from the Social Impact Assessment compiled by Tony Barbour and included as **Appendix F5**.*

ADMINISTRATIVE CONTEXT

The proposed Esizayo WEF Expansion Project is located in the Laingsburg Municipality (LM), in the Western Cape Province (**Figure 6-27**). The LM is one of three local municipalities that make up the Central Karoo District (CKD) Municipality (**Figure 6-28**). Beaufort West and Laingsburg are the administrative seats of the CKD and LM respectively. The small settlement of Matjiesfontein and the town of Laingsburg are located ~ 25 km and 35 km to the south and southeast of the site, respectively. The town of Sutherland in the Karoo Hoogland Municipality within the Northern Cape Province is located ~ 61 km north of the site. An overview of the Karoo Hoogland Municipality is provided given the location of the site.

Figure 6-27: Location of Laingsburg Municipality within Western Cape Province

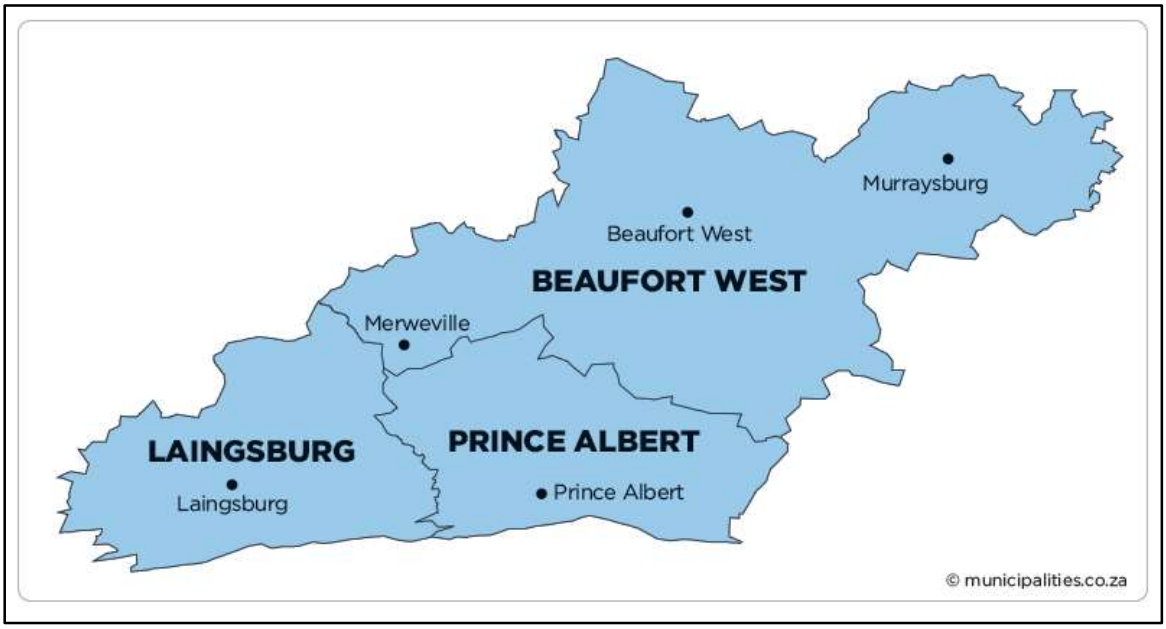


Figure 6-28: Location of Laingsburg Municipality within the Central Karoo District Municipality

DEMOGRAPHIC OVERVIEW OF LAINGSBURG MUNICIPALITY

POPULATION

Based on the 2016 Community Household Survey the population of the LM was 8 895. The LM IDP indicates that ~ 80% population reside in Laingsburg, while ~15% live in the rural parts of the municipal area and 5% reside in the small settlement of Matjiesfontein. In terms of race groups, Coloureds made up 88.2%, followed by Whites (10%) and Black Africans (1.7%). The main first language spoken in the LM was Afrikaans (96%), followed by English (1%) and IsiXhosa (0.8%) (Community Household Survey 2016).

The 2019 Socio-Economic Profile for the Laingsburg Municipality (LM) prepared by the Western Cape Department of Social Development, indicates that the population of the Laingsburg Municipality in 2021 is projected to be 9 024, increasing to 9 367 by 2023. This equates to a 1.1 % annual average growth rate. The estimated population growth rate of Laingsburg is therefore slightly above the estimated population growth of the CKD of 0.5%.

HOUSEHOLDS AND HOUSE TYPES

Based on the information from the 2016 Household Community Survey there were 2861 households in the LM. The overwhelming majority of households resided in formal houses (96.5%). This is similar to the figure for the District (97.3%) and significantly higher than the figure for the Western Cape (72.2%). Only 1.6% of the households in the LM resided in shacks. In terms of ownership, 55.7% of houses are owned and fully paid off, 5.3% are owned but in the process of being paid off, 17.9% are rented, and 10.3% are occupied rent free. The high percentage of formal houses coupled with high level of homeownership reflects a stable, middle-class community. However, as indicated below, household income levels are low.

Based on the information from the 2016 Community Household Survey 31.8% of the households in the LM are headed by females. Although the figures are lower than the CKD (40.8%) and Western Cape (38%), the relatively high number of female-headed households at the local municipal level reflects the lack on formal employment and economic opportunities in the LM. As a result, job seekers from the LM need to seek work in the larger centres, specifically Cape Town and Winelands area. The majority of the job seekers are likely to be males. This is due to traditional rural patriarchal societies where the role of the women is usually linked to maintaining the house and raising the children, while the men tend to be the ones that migrate to other areas in search of employment.

HOUSEHOLD INCOME

Based on the data from the 2011 Census, 5.5% of the population of the LM had no formal income, 2% earned less than R 4 800, 2.8% earned between R 5 000 and R 10 000 per annum, 20.7% between R 10 000 and R 20 000 per annum and 25.3% between R 20 000 and R 40 000 per annum (2016).

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 56.3% of the households in the LM live close to or below the poverty line. The figures for the CKD and Western Cape were 62.9% and 50.1% respectively. The low-income levels reflect the limited employment opportunities and dependence on the agricultural sector. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the LM. This in turn impacts on the ability of the LM to maintain and provide services.

EMPLOYMENT

The 2019 Socio-Economic Profile for the Laingsburg Municipality notes that the unemployment rate in the LM has fluctuated between 14.8 and 17.7 % over the last 10 years. Unemployment in Laingsburg area started at 15.9 per cent in 2008, rising steadily to 17.7% in 2010 and then dropping to 15.6% in 2018. The unemployment in the LM in 2018 (15.6%) is lower than the figure for the CKD (20.7%) and Western Cape (17.7%).

EDUCATION

Education levels in the LM are reflected by the percentage of the population under the age of 20 that have no education, the percentage that have some primary and or have completed primary school, and the percentage that have passed grade 12 (matric). Based on the 2016 Household Community Survey, 9.2% of the population over the age of 20 had not formal education. This is significantly higher than the figures for Central Karoo (5.8%) and Western Cape (2.4%) and reflects the rural nature of large parts of the LM. The percentage with some primary and primary school was 14.4%, compared to 14.1% and 8.2% for the Central Karoo District and Western Cape Province, respectively. The percentage with matric was 26.2%, which compares favourably with the 29.9% for the CKD, but is lower than the 35.2% for the Western Cape.

MUNICIPAL SERVICES OF LAINGSBURG MUNICIPALITY

ELECTRICITY

Based on the information from the 2016 Community Survey 98.6% of households in the LM had access to electricity. Of this total 84.8% had in-house prepaid meters, while 8% have conventional in-house meters, and 3% had solar power. Only 1.4% of households did not have access to electricity, this is similar to the figures for the CKD (1.29%) and Western Cape (1.85%).

ACCESS TO WATER

Based on the information from the 2016 Community Survey 89.4% of households were supplied by a regional or local service provider. In terms of access to water, 94.5% of the households in the LM has access to water. Of this total 63.3% had piped water inside their houses, while 31.2% relied on piped water inside the yard. The figures piped water supplied inside of homes for the CKD and Western Cape were 75.7% and 80.7% respectively. The figures for the LM are therefore lower than the district and provincial levels.

SANITATION

Based on the information from the 2016 Community Survey, 97.7% of households have access to flush toilets, while 1.5% rely on bucket toilets and only 0.3% reported no access to toilet facilities. The access to flush toilets is marginally higher than the CKD (97.5%) and Western Cape (95/6%). The figures for no access are also lower than CKD (0.4%) and Western Cape (0.7%). Based on the 2016 Community Survey most of the households in the LM (97.7%) have access to flush toilet facilities, with only 0.3% reporting having no access to toilet facilities

REFUSE COLLECTION

Based on the information from the 2016 Community Survey, 89.9% of households have their refuse collected by a local authority of private company on a regular basis, while 9.2% rely on their own waste disposal dump. The relatively high number that dispose of their waste at their own dump reflects the rural nature of the LM. The majority of these households are likely to be associated with farms in the LM. Based on the 2016 Community Survey most of the households in the LM (89.7%) have their waste collected on a regular basis by a service provider.

EDUCATION AND HEALTH CARE FACILITIES OF LAINGSBURG MUNICIPALITY

EDUCATION FACILITIES

In terms of school facilities, there are four primary schools in the LM. Two are located in Laingsburg, one Matjiesfontein and one in Vleiland. Three of the primary schools are government schools and one is private. The majority of the students from the private school complete their schooling at schools located outside of the LM. There is only secondary school in Laingsburg, the Laingsburg High School. The IDP notes that the Laingsburg High School is under financial pressure. Many of the scholars that attend the school are unable to pay school fees as the majority are from previously disadvantaged areas. Despite this the LM achieved a 100% matric pass rate in 2020. However, as indicated under learner rendition, there is a high drop-out rate between Grade 10 and 12.

The Laingsburg High School was recently declared a non-fee school which reflects the low household income and high poverty levels in the area. Due to staff shortages the high school does not offer maths and science. Pupils that wish to study maths and science therefore have to attend schools in Touws River or Worcester. This requires them to become borders which increases the costs to parents.

Of the four government schools, 50% (2) were equipped with libraries in 2018. However, the shortage of funds as schools, such as the Laingsburg High School, is likely to impact on the quality of the libraries. There are no Further Education and Training (FET) colleges in Laingsburg with the closest one is located in Worcester, which falls outside the Central Karoo District. Further away is Beaufort West, Oudtshoorn, Paarl, Stellenbosch, George and Mosselbay.

HEALTH CARE FACILITIES

Access to healthcare services is a basic human right and one that is directly affected by the number and spread of facilities within their geographical area. In terms of healthcare facilities, Laingsburg had 3 primary healthcare clinics (PHC) in 2018, which consisted of 1 fixed and 2 mobile clinics. In addition, there is also a district hospital, the Laingsburg District Hospital, located in Laingsburg. There are also three Tuberculosis and one Antiretroviral and 3 clinics/sites.

There are no health facilities located in the area to the north of the N1 and none in the other rural areas. The rural areas are served by mobile clinic routes. The Department of Provincial Health has identified 17 mobile clinic routes within the LM. At least one route is covered per day, sometimes even two. In the event of medical emergencies patients are transported to either to Laingsburg or the clinic in Matjiesfontein. The LM had 1 ambulance per 10 000 inhabitants in 2018, which is on par with the CKD average of 1 ambulance per 10 000 people. However, the large distances associated with the isolated rural communities impacts on the efficiency of the ambulance services within the LM.

CHILD HEALTH

Child health is a key indicator of well-being and potential needs. The United Nations Sustainable Development Goals (SDGs) aim to end preventable deaths of new-borns and children under 5 years of age by 2030, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1 000 live births and under-5 mortalities to at least as low as 25 per 1 000 live births (Source: UN SDG's). Key criteria used to measure child health include immunisation rates, percentage of malnourished children, neonatal mortality rate and birth weight .

The immunisation coverage rate for children under the age of one in the LM dropped from 80.7% in 2017/18 to 59.1% in 2018/19. The CKD average for 2018/19 was 71.3%. The drop on the immunisation rate is a concern. However, the number of malnourished children under five years (per 100 000) in 2017/18 was 1.3. This decreased to zero in 2018/19. The neonatal mortality rate (NMR) (deaths per 1 000 live births before 28 days of life) for the Laingsburg municipal area remained at zero deaths in 2017/18 and 2018/19. The low-birth weight indicator for Laingsburg increased slightly from 25.7% in 2017/18 to 26.6 % in 2018/19. The decrease in the number of malnourished children under five years and NMR to zero in 2018/19 represents a positive improvement in child health and supports the achievement of SDGs. Although the low birth rate has increased, this has not impacted on the NMR.

DEMOGRAPHIC OVERVIEW OF KAROO HOOGLAND MUNICIPALITY

An overview of the Karoo Hoogland Municipality is provided given that the site borders on to the southern boundary of the municipality and that the town of Sutherland may be impacted by the proposed expansion.

POPULATION

Based on the 2016 Community Household Survey the population of the KH was 13 010. In terms of race groups, Coloureds made up 79.3%, followed by Whites (19.7%) and Black Africans (0.7%). The main first language spoken in the KH was Afrikaans (98.5%), followed by IsiXhosa (0.4%) and English (0.3%) (Community Household Survey 2016).

In terms of age, the 2016 Household Community Survey found that 31% of the population were under the age of 18, 58% were between 18 and 64, and the remaining 11% were 65 and older. The KH therefore has a relatively large young population. This creates challenges in terms of creating employment opportunities

The high percentage of young people also means that a large percentage of the population is dependent on a smaller productive sector. The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates reduced revenue for local authorities to meet the growing demand for services. The national dependency ratio in 2011 was 52.7%, lower than the figure for the Northern Cape (55.7%). The dependency ratio for the KH in 2011 was 50.9%. The traditional approach is based people younger than 15 or older than 64. The 2016 information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e. they are still likely to be at school or dependent upon their parents or other family members).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratio for the LM (2016) was 72%. This figure is significantly higher than the national, provincial, and municipal levels in 2011. The higher dependency ratio reflects the limited employment opportunities in the area and represent a significant risk to the district and local municipality.

HOUSEHOLDS, HOUSE TYPES AND OWNERSHIP

Based on the information from the 2016 Household Community Survey there were 4621 households in the KH. The overwhelming majority of households resided in formal houses (97.6%). This is higher than the figure for the District (88.4%) and significantly higher than the figure for the Northern Cape (74.4%). Only 0.4% of the households in the KH resided in shacks, compared to 2.3% and 12.8% for the District and Province, respectively (Table 3.9). In terms of ownership, 63.6% of houses are owned and fully paid off, 4.4% are owned but in the process of being paid off and 8.5% are rented. The high percentage of formal houses coupled with high level of homeownership reflects a stable, middle class community. However, as indicated below, household income levels are low.

Based on the information from the 2016 Community Household Survey 32.4% of the households in the KH are headed by females. Although the figures are lower than the ND (37.5%) and Northern Cape (38.8%), the relatively high number of female-headed households at the local municipal level reflects the lack on formal employment and economic opportunities in the KH. As a result, job seekers from the LM need to seek work in the larger centres, specifically Cape Town and Winelands area. The majority of the job seekers are likely to be males. This is due to traditional rural patriarchal societies where the role of the women is usually linked to maintaining the house and raising the children, while the men tend to be the ones that migrate to other areas in search of employment.

HOUSEHOLD INCOME

Based on the data from the 2011 Census, 6.6% of the population of the KH had no formal income, 2.4% earned less than R 4 800, 5% earned between R 5 000 and R 10 000 per annum, 24.6% between R 10 000 and R 20 000 per annum and 26.2% between R 20 000 and R 40 000 per annum (2016).

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 64.8% of the households in the KH live close to or below the poverty line. The figures for the ND and Northern Cape were 58.1% and 62.5% respectively. The low-income levels in the KH reflect the limited employment opportunities and dependence on the agricultural sector. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the KH. This in turn impacts on the ability of the KH to maintain and provide services.

The low household income levels are reflected in the number of indigent households in the KH, which had 944 registered indigent households in 2016. This represents 20% of the total number of households in the KH.

EMPLOYMENT

Based on the 2011 Census the official unemployment figure for the KH was 8%. The figures also indicate that the majority of the population are not economically active, namely 40.4%. The unemployment figure is lower than the official unemployment rate for the ND (11.1%) and Northern Cape (14.5%). While the level of unemployed is low, this needs to be considered within in the context of the low-income levels and the dependence on the agricultural sector.

EDUCATION

Education levels in the KH are reflected by the percentage of the population under the age of 20 that have no education, the percentage that have some primary and or have completed primary school, and the percentage that have passed grade 12 (matric). Based on the 2016 Household Community Survey, 13.2% of the population over the age of 20 had not formal education. This is significantly higher than the figures for ND (4.4%) and Northern Cape (7.9%) and reflects the rural nature of large parts of the KH. The percentage with some primary and primary school was 14%, compared to 12.6% and 13.4% for the ND and Northern Cape Province, respectively. The percentage with matric was 29.2%, which was higher than the ND (27.1%) and Northern Cape (29.1%) (Table 3.10). The higher matric rates are interesting, specifically given the figure for no formal education. However, despite the higher matric pass rates, the Namakwa IDP notes that the KH has the lowest functional literacy rate in the ND. defines functional literacy as the number of people in a region that are 20 years and older and have completed at least their primary education (i.e. grade 7). Functional literacy describes the reading and writing skills that are adequate for an individual to cope with the demands of everyday life - including the demands posed

in the workplace. This is contrasted with illiteracy in the strictest sense, meaning the inability to read or write. Functional literacy enables individuals to enter the labour market and contribute towards economic growth thereby reducing poverty.

MUNICIPAL SERVICES OF KAROO HOOGLAND MUNICIPALITY

ELECTRICITY

Based on the information from the 2016 Community Survey 96.6% of households in the LM had access to electricity. Of this total 66.7% had in-house prepaid meters, while 6.6% have conventional in-house meters, and 20.3% had solar power. Only 3.4% of households did not have access to electricity, this is marginally higher than the figures for the ND (2.2%), but higher than the figure for the Northern Cape (6.7%). Based on the 2016 Community Survey most of the households in the LM (74.3%) are supplied with electricity by the KH. The high percentage of households that use solar energy reflects the rural nature of the area.

ACCESS TO WATER

Based on the information from the 2016 Community Survey 69% of households were supplied by a regional or local service provider, while 30.4% relies on their own source of water. The higher percentage of households that rely on their own source of water reflects the rural nature of the area, where large distances make difficult and expensive to provide services to all areas, specifically farms. In terms of access to water, 74.9% of the households in the KH had had piped water inside their houses, while 21.4% relied on piped water inside the yard. The figures piped water supplied inside of homes for the ND and Northern Cape were 72.1% and 45.3% respectively. The figures for the KH are therefore higher than both the district and provincial levels. The figure for water supplied by boreholes (2.4%) is higher than both the ND (0.8%) and Northern Cape (1.3%). This reflects the rural character of large areas of the KH. Based on the 2016 Community Survey most of the households in the LM (99.4%) have access to potable water, with 69% being supplied by a regional or local service provider.

SANITATION

Based on the information from the 2016 Community Survey, 69.7% of households have access to flush toilets, 17.4% rely on pit toilets, 9.3% use bucket toilets, and 2.7% reported no access to toilet facilities. The access to flush toilets is significantly lower than the ND (82.3%) and marginally lower than the Northern Cape (71.6%). The figures for no access are higher than the ND (1.9%) but lower than the Northern Cape (4%). Based on the 2016 Community Survey most of the households in the KH (69.7%) have access to flush toilet facilities, with only 2.7% reporting having no access to toilet facilities.

REFUSE COLLECTION

Based on the information from the 2016 Community Survey, 67.9% of households have their refuse collected by a local authority of private company on a regular basis, while 30% rely on their own waste disposal dump. The high number of households that dispose of their waste at their own dump reflects the rural nature of the KH. The majority of these households are likely to be associated with farms in the KH. Based on the 2016 Community Survey most of the households in the LM (67.9%) have their waste collected on a regular basis by a service provider. This percentage is likely to represent the majority of households located in the three towns in the KH

In summary, based on the 2016 Community Survey the service levels in the KH can be describe as relatively high. In this regard 74.3% of households are supplied with electricity, while 20.3% have access to solar power, 99.4% have access to potable water, with 69% being supplied by a regional or local service provider, 69.7% have access to flush toilet facilities, with only 2.7% reporting having no access to toilet facilities, and 67.9% have their waste collected on a regular basis by a service provider. The percentages should also be considered within in the context of the rural nature of large parts of the KH. In this regard the service levels in the three towns in the KH are likely to be higher than for the entire KH.

EDUCATION AND HEALTH CARE FACILITIES OF KAROO HOOGLAND MUNICIPALITY

EDUCATION FACILITIES

In terms of school facilities, each of the three towns in the KH serviced by a primary and a high school. The high school in Sutherland was damaged by a fire in 2018. The Northern Cape Provincial Health Department Annual Report (2018/19) notes that the ND, which includes the KH, is one of the largest district municipalities in the Northern Cape but at the same time is home to the lowest population. Most schools in this ND are located in

remote areas and a large number of them have infrastructure assets which are under-utilised. The ND also has the largest number of school hostels in the Province, due to its geographical size.

There are no Further Education and Training (FET) colleges in Sutherland with the closest one is located in Worcester, which is located in the Breede Valley Municipality in the Western Cape. There is also a training college in Beaufort West, which is located in the Central Karoo District Municipality.

HEALTH CARE FACILITIES

Access to healthcare services is a basic human right and one that is directly affected by the number and spread of facilities within their geographical area. The provision of health care and the associated services is a provincial function provided by the Western Cape Department of Health. The IDP notes that the services provided in the KH are not satisfactory due to shortage of doctors, ambulances as well as inferior conditions of the road infrastructure between the towns. There are 3 clinics in the municipal area, one in each of the three towns, namely Williston, Fraserburg and Sutherland. Due to the distance rural nature of the area and the distances involved, rural communities have requested mobile clinics. There is currently no resident doctor in Sutherland. There are two doctors at the clinic in Calvina (160 km). Most residents that require a doctor travel to the hospital in Worcester.

6.2.2 ECONOMIC OVERVIEW

The following is extracted from the Social Impact Assessment compiled by Tony Barbour and included as ***Appendix F5****.*

LAINGSBURG MUNICIPALITY

Economic activity in the LM plays a key role in terms of creating employment opportunities and addressing poverty and human development. The ability of households to pay for services such as water, electricity, sanitation, and refuse removal is dependent upon the ability to generate income from economic activities. A slowdown or deterioration in economic activities typically results in job losses and the inability of households to pay for services, which in turn impacts on municipal revenues and the ability to provide and maintain services and municipal infrastructure.

ECONOMIC SECTORS

In terms of key sectors, the local economy in the LM was dominated by the agriculture, forestry and fishing which contributed 27% to Geographical Gross Domestic Product (GGDP) in 2017, followed by general government (18.7%) and wholesale and retail trade, catering and accommodation (13.4 %). These three sectors made up 56.7% of the LMs GGDP in 2017, estimated to be worth R425.4 million. While there was strong growth of 10.5% in the agriculture, forestry, and fishing sector in 2017, the sector was expected to contract by 2.4 % in 2018 due to the drought at the time. The local economy, like the national economy, will also have been negatively impacted by the COVID-19 pandemic and associated lockdowns during 2020 extending into 2021.

EMPLOYMENT

In terms of employment, the agriculture, forestry and fishing sector was the most important sector in 2017, making up 31.2% of all jobs, followed by wholesale and retail trade, catering and accommodation (19.1%), community, social and personal services (17.2%) and general government (16.1 %). The agriculture, forestry and fishing sector in the Laingsburg municipal area reported net job losses (-285) between 2008 and 2017. This is a major cause for concern given the key role played by the sector in the Laingsburg economy. The sector which reported the largest increase in jobs between 2008 and 2017 was community and, social & personal services (159) followed by general government (147), wholesale and retail trade, catering, and accommodation (86) and construction (85) sectors. The COVID-19 pandemic is likely to have resulted in job losses during 2020, extending into 2021.

In terms of skills levels, the labour forces in the LM in 2017 consisted mainly of semi-skilled (49.6 %) and low-skilled (34.3 %) workers. The semi-skilled and low-skilled categories (4.2%) grew notably faster than the skilled category (3.2 %) between 2014 and 2018. This is due to the relatively undeveloped nature of the local economy and limited demand for skilled workers. Of relevance to the Needs Assessment, the 2019 Socio-Economic Profile for the Laingsburg Municipality notes that the development of renewable energy facilities in the area will result in an increase in the demand for skilled labour which will create skills and development opportunities for low-skilled and semi-skilled workers.

KAROO HOOGLAND MUNICIPALITY

Economic activity in the KH plays a key role in terms of creating employment opportunities and addressing poverty and human development. The ability of households to pay for services such as water, electricity, sanitation, and refuse removal is dependent upon the ability to generate income from economic activities. A slowdown or deterioration in economic activities typically results in job losses and the inability of households to pay for services, which in turn impacts on municipal revenues and the ability to provide and maintain services and municipal infrastructure.

ECONOMIC SECTORS

In terms of key sectors, the local economy in the KH was dominated by the agriculture, forestry and fishing which contributed 34% to Gross Value Added (GVA) in 2017, followed by Community services (21%), trade (17%) and transport (12%). The sectors that contributed the least were the mining (0%), electricity (1%) and manufacturing (1%).

The Gross Domestic Product (GDP) growth in KH has been fairly consistent over the years since 1996 till 2014. The rate ranges from nearly 2, 2% in 2005 to 0.02% in 1998. The periods when droughts or other factors have played a part are reflected by periodic declines in 1998, 2002, 2006, 2015. These effects are due to the dominant role played by the agriculture and community services sector. On average the growth over the period was 0,9% which shows the consistent contribution by the agriculture sector over this time period. The steepest decline was experienced during 2005 and 2015 during drought years. The local economy, like the national economy, will also have been negatively impacted by the COVID-19 pandemic and associated lockdowns during 2020 extending into 2021.

EMPLOYMENT

In terms of employment, the agriculture sector was the most important sector in 2015, making up 33% of all jobs, followed community services (32%), trade (14%), households (11%), and finance (6%). The COVID-19 pandemic is likely to have resulted in job losses during 2020, extending into 2021. The reliance of the KH on the agriculture sector also makes the KH vulnerable to droughts and fluctuations in commodity prices. Added to this the community services sector which accounts for 32% of all jobs is associated with reliance on municipal and government aid and functions.

6.2.3 HERITAGE

The following is extracted from the Heritage Impact Assessment compiled by ACO Associates and included as ***Appendix F3****.*

The Roggeveld was settled by European stock farmers from as early as 1750 (Schoeman 1986; Penn 2005). The early farmers found the escarpment, which enjoys the highest rainfall, particularly suitable for small stock farming during the summer months but moved down into the valleys and plains of the Karoo to escape the extreme winters. Drought, poor grazing and attacks by the San caused many farms to be abandoned. According to Penn (2005), in the 18th century there were numerous independent Khoekhoen kraals located amongst the Trekboer farms in the Roggeveld. While the violent conflict between the various groups has been well documented, very little is known of the peaceful interaction and assimilation which took place over the last 200 years.

The survey tracks and the positions of any heritage resources located during the survey were recorded as waypoints (**Figure 6-29**).

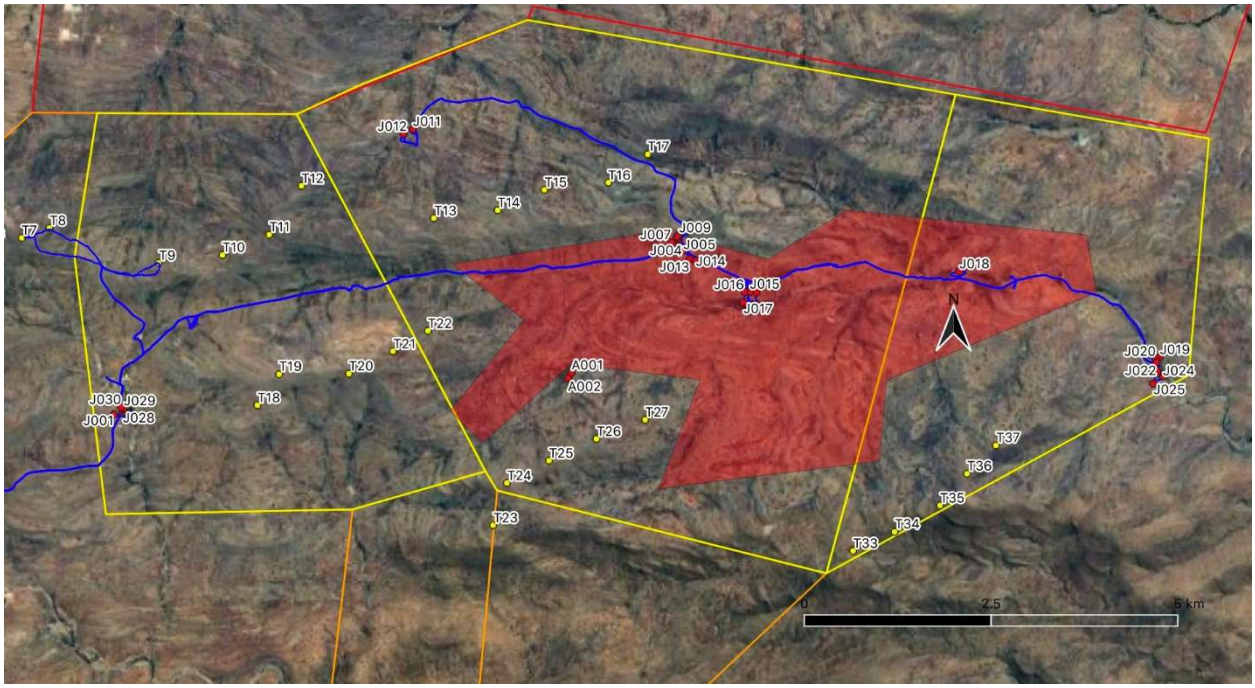


Figure 6-29: Survey track plots (blue lines) and heritage sites (numbered red dots) recorded during the March 2022 field survey. The Exclusion Area is shaded red (Source: Google Earth).

HISTORICAL BUILT ENVIRONMENT

The built environment of the WEF expansion area, like that in the Esizayo WEF, is characterised by farmhouses (some containing an inner core dating to the 19th century), barns, and stone kraals and shepherds' huts. Shepherds' stockposts consisting of small, low-walled stone huts and adjacent kraals are found dotted around the landscape.

These shepherds' huts reflect the original form of the farmhouses in this area which comprised a "small oblong low hut" built of slabs of leiklip piled on top of each other, un-plastered, with a reed roof. These structures were often expanded in the 19th century into the larger farmhouses found on the farm werfs today. According to Webley and Halkett (2017a) a fine, although much altered, example of a 19th century vernacular farmhouse can be found on Wolven Hoek in the Maralla West WEF.

The colonial settlements of this area are invariably found in river valleys, close to a permanent source of water and the three clusters of historical stone-built kraals and farm dwellings identified within the expansion area are all situated near watercourses.

Two examples of remote shepherds' huts with small associated kraals were recorded, and both are also close to small streams (J011 & J012, and A001 & A002 on Figure 4).

Apart from the farm complex on Aanstoot which is still used, none of the other historical settlements or structures identified were occupied and are either ruinous or abandoned.

Ceramics and glass noted at these settlements suggest occupation since at least the first half of the 19th century.

The farm complex at Aanstoot (**Figure 6-30**) consists of a highly modified farmhouse (J028) with what seems to be an early core, two barns (J029 and J0271) one with animal stalls attached, and a more recent labourer's cottage (J030). There is a large, square stone-walled kraal (J001) on the rise behind the werf, and a series of stock pens below the werf, which include a sheep dip. A large and old orchard is located between the farm buildings and river.

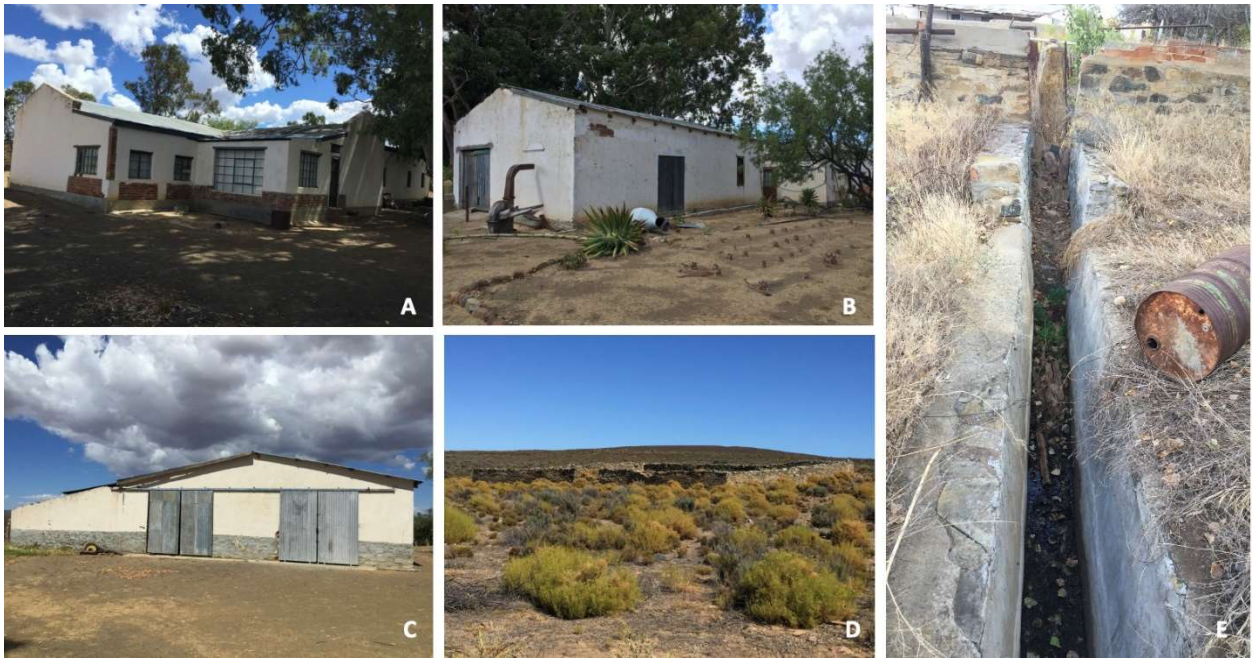


Figure 6-30: Aanstoot farm complex. A = farmhouse (J028); B = barn (J029); C = barn (J0271); D = stone-walled kraal (J001); E = sheep dip

The Leeuwenfontein farm werf (**Figure 6-31**) is larger and appears to be older than that on Aanstoot. It consists of a large farmhouse with attached a barn (J002). A more modern corrugated iron shed has been affixed to the front of the barn. Part of the barn was originally a stone-walled kraal. A portion of this original kraal still exists behind the building and there is a well-preserved packed stone sheep dip with associated cobbled area adjacent to it (J008). A large stone-walled kraal occupies the rise behind the house (J007), with a smaller, much modified kraal situated below and to the south of the house (J004). A circular, stone threshing floor was recorded approximately 130 m south of the house (J005) and a small, circular shepherd's hut (J009) is built on the far side of the river north of the house. Two historical ash heaps containing ceramics, glass, bone and metal were recorded at J003 and J006.

Approximately 900 m to the south-east of this farm complex is a very large, square stone-walled structure covering an area of roughly 150 x 120 m (**Figure 6-31**). The structure is walled on three side but not on the side which abuts the river. Its rocky substrate suggests that is unlikely to have been a field, and has thus been interpreted as a kraal, also associated with the Leuuwenfontein farm complex.

Figure 6-31: Leeuwenfontein farm complex: A = farmhouse (J002); B & D = kraal built into barn (J008); C = shepherd's hut (J009); E = sheep dip; F = threshing floor (J005)

The second, unnamed farm complex is situated at the at the extreme eastern edge of WEF expansion site (**Figure 6-32**) at the confluence of three watercourses. Now largely ruinous, the complex consists of a flat-roofed, packed stone house, a large kraal on a hill behind (J019), a smaller kraal below the house (J022) and a series of walled fields on the river flood plain below the house (J024 & J027). A long packed stone wall lines the cliff edge behind the house and adjacent to the large kraal (J020). The foundations of a small, square building were recorded some distance from the house, and have been interpreted as a shepherd's hut (J026). Lastly, what appears to a roughly built rectangular kraal is located approximately 200 m south of the house. Although no ash heap was found during the survey, a number of 19th century ceramics were recorded on the rocks upslope form the house, and ceramics, glass, bone, and ostrich eggshell were recorded around the possible shepherd's hut.

Figure 6-32: Unnamed farm complex: A & B = ruined farmhouse; C = kraal (J019); D = shepherd's hut (J026); E = 19th century ceramics noted on site; F = wall above cliff (J020)

Two remote shepherd's posts, each consisting of a small dwelling structure and a small nearby kraal were recorded, both potentially linked to the Leeuwenfontein farm complex. J011 is a small rectangular shepherd's hut, situated in the north of the expansion site on the slopes above the Komsberg substation (**Figure 6-33**). This hut is interesting in that it appears to have had a pitched roof, the apex of which was probably less than 1.8 m above the ground. The hut is built directly above a small steam. Some ceramics, glass and metal fragments were noted on the slope below the structure. A small kraal, was found approximately 400 m away, tucked in below cliffs next to the stream.

Figure 6-33: A-C = Shepherd's hut (J011); D = kraal below cliff

The second shepherds' post was located by John Almond and Madelon Tusenius during the palaeontological assessment. It is located up a remote valley approximately 2 km south-west of the Leeuwenfontein complex and consists of a low-walled, circular, stone-built hut (A001), and a small circular packed stone kraal (A002) nearby (**Figure 6-34**).

Figure 6-34: Circular, stone-built hut (A001) and associated circular packed stone kraal (A002)

CEMETERIES AND GRAVES

A small farm graveyard was identified approximately 300 m southeast of the main house on the Leeuwenfontein farm complex (**Figure 6-35**).

At least five graves could be identified on the site. Two were marked with plastered brick surrounds and three by shale slabs (**Figure 6-36**).

Figure 6-35: Farm graveyard at Leeuwenfontein. Note the cement plasters grave surrounds left and right and the less formal slate grave markers centre

Figure 6-36: Examples of grave marked with slate and stone (left) and plastered brick surround (right)

6.2.4 PALAEONTOLOGY

The following is extracted from the Palaeontolgy Impact Assessment compiled by Natura Viva and included as ***Appendix F4****.*

The Great Karoo is world-famous for its rich record of terrestrial vertebrates and other fossils from the Permian, Triassic and Early Jurassic Periods in Gondwana (Rubidge 1995, MacRae 1999, Rubidge 2005, McCarthy & Rubidge 2005, Smith *et al.* 2012). The fossil record of the Klein-Roggeveld region is very poorly known by Karoo standards but our knowledge has been improved in recent years through several palaeontological impact assessments in the area.

Sparse fossil remains recorded from the lower portion of the Abrahamskraal Formation (Lower Beaufort Group / Adelaide Subgroup) in the previously assessed Esizayo WEF and grid connection study area include low-diversity trace fossil assemblages (invertebrate burrows, casts of reedy plant stems – probably horsetail ferns). Locally abundant striated plant stem, root / rhizome (?) and leaf compressions, casts and moulds are probably attributable, at least to a large extent, to sphenophytes or horsetail ferns (Almond 2016f, Almond 2021b). It is notable that no well-preserved petrified wood or terrestrial vertebrate remains have been recorded so far from these lowermost beds of the Abrahamskraal Formation in the Esizayo, Karusa and Komsberg Substation study areas. Some of the moulds of larger plant axes illustrated in the recent PIA reports might have belonged to woody plants, however. Mudrock horizons containing assemblages of vertical subcylindrical casts of lungfish burrows (Dipnoichnus) occur at intervals within the lowermost Abrahamskraal Formation beds. Puzzling larger, upward- or downward-tapering, sandstone-infilled structures in the same beds might be biogenic (e.g. tree trunk casts) or perhaps pipes or dykes related to sediment dewatering (Almond 2021b).

The fossil assemblages within the lowermost Abrahamskraal Formation beds represented within the Esizayo WEF Expansion project area, pre-dating as well as following the incoming of maroon red bed facies, are provisionally assigned to the Middle Permian Eodicynodon Assemblage Zone within which vertebrate skeletal remains are notoriously extremely rare (Rubidge 1995, Smith et al. 2012, Rubidge & Day 2020; see also short review in Almond 2021a). It is therefore of scientific interest that very occasional tetrapod burrows, and even disarticulated cranial and post-cranial skeletal remains, have now been recorded from this stratigraphic level in the Brandvalley WEF study area (Almond 2016c). Fragmentary temnospondyl amphibian skeletal remains have recently been reported from the lowermost Abrahamskraal Formation in the Kareebosch WEF project area (Almond 2021a). No fossil tetrapod skeletal fossils or trace fossils have been recorded from the lower Abrahamskraal Formation in the Esizayo WEF and grid project area (Possible amphibian remains are known from the underlying Waterford Formation here).

The occurrence of (rare) amphibian remains and trackways, common horizons of horsetail fern debris as well as lungfish burrow casts and invertebrate traces of the Scoyenia Ichnofacies supports the prevalence of lacustrine and swampy wetland settings on the early Abrahamskraal Formation delta platform or distal floodplain. As argued above (Section 3), the sedimentology of these beds suggests protracted intervals of high water tables with episodes of aridity and desiccation which would have favoured animals, such as lungfish, that were well-adapted for aestivation.

The commonest fossils and biosedimentary structures recorded within the Esizayo WEF Expansion project area (Figs. 38 to 44) are generally associated with wave rippled palaeosurfaces preserved round the margins of delta plain or floodplain ponds and lakes or water courses. They comprise various microbial mat textures, possible adhesion warts, narrow simple horizontal burrows (possible of undermat-mining insects), cylindrical arthropod scratch burrows of the Scoyenia Ichnofacies as well as arrays of vertical stem casts of reedy plants.

The only fossils recorded from the pervasive Late Caenozoic superficial sediments mantling the Karoo Supergroup (Abrahamskraal Formations) bedrocks in the Esizayo WEF Expansion study area consist of spongy, highly porous horizons or bodies of indurated sandy sediment within calcretised, well-consolidated older alluvial deposits (Figs. 37 & 44). These bioturbated horizons may be attributable in part to calcretised plant roots but it is likely that most of the bioturbation structures were generated by burrowing insects such as termites.

6.2.5 ARCHAEOLOGY

The following is extracted from the Heritage Impact Assessment compiled by ACO Associates and included as ***Appendix F3****.*

Very little Early or Middle Stone Age (ESA / MSA) archaeology has been identified previously in the area. Halkett & Webley (2011) in their survey for the proposed Sutherland WEF observed MSA artefacts including scatters of polished/patinated stone chunks, flakes and cores, with occasional denticulated or notched pieces noted. Distinctive bifaces representative of the ESA were only seen on one site.

The same study recorded only a handful of well-defined Later Stone Age (LSA) sites, some associated with indigenous ceramics, generally located in proximity to water sources, near springs or on riverbanks. The LSA stone artefact assemblages included thumbnail scrapers and the raw material included a grey chert. Large flakes on indurated shale or hornfels were also common. In addition, they identified the presence of "open Khoekhoen encampments" along the dry riverbeds in the bottom of valleys.

The archaeological assessments conduced for the Esizayo WEF (Webley and Halkett 2017a & b) and Esizayo OHPL (Gribble 2021) on the farms immediately to west of the proposed WEF expansion site recorded only a handful of pre-colonial sites or materials, including two small shelters with rock paintings and associated artefacts on the farm Aurora. A further rock art site was reported by Mr Hanekom from the farm Saaiplaas north of the expansion area (Webley and Halkett 2017a & b). The MSA lithics noted were similar to those reported by Halkett & Webley (2011) – thin scatters or isolated occurrences of heavily patinated flakes, chunks and cores, generally made on hornfels. A few "pastoralist settlements" containing LSA artefacts, ceramics and grindstones were located along dry riverbeds in the bottom of valleys on Aurora.

One of the most common types of pre-colonial sites found in the Roggeveld are stone kraals or structures which typically consist of dry-stone walled enclosures in a roughly circular configuration, sometimes interlocking but not more than half a metre high and ranging from 3 – 4 meters in diameter. It is believed that many of these stone structures represent pre-colonial "kraals" for small stock such as fat-tailed sheep and goats although it is difficult to determine which are pre-colonial and which are colonial era in date. A number of these kraals were found distributed along the lower slopes of small koppies, and close to streams or fountains within the Esizayo WEF. No significant archaeological resources were identified on the high lying ridges which will accommodate the wind turbines.

Elsewhere in wider vicinity of the Esizayo WEF Lloyd Evans et al. (1985) excavated a small rock shelter containing a LSA assemblage on the grounds of the South African Astronomical Observatory outside Sutherland. They comment (1985: 108) that the "presence of the shell beads points to cultural ties with people along the Cape coast while the small scrapers found can be assigned to the Wilton industry". Also near Sutherland Hart (2005) reported finding a dense artefact scatter associated with a shallow rock shelter while doing a survey for a golf course to the south of the town. The study indicated that archaeological sites can be expected in areas that were sheltered from the wind.

SURVEY RESULTS

The survey for the Esizayo expansion project undertaken by ACO Associates in March 2022 found very limited evidence of archaeological material.

A couple of isolated MSA stone artefacts were noted, including a large circular flake found in the streambed adjacent to the Leeuwenfontein farm complex (**Figure 6-37**).

A small scatter of LSA chert and silcrete lithics (including a possible ESA core on a river cobble) were recorded in a sandy area next to the river at J018, approximately 3 km east of the Leeuwenfontein farmstead (**Figure 6-38**).

No other archaeological sites or material were noted.

Figure 6-37: MSA flake found in the streambed at the Leeuwenfontein farmstead

Figure 6-38: Possible ESA core (left) and LSA chert scraper (right) found at J018

6.2.6 LAND USE AND VISUAL

The following is extracted from the Visual Impact Assessment compiled by Lourens Du Plessis and included as ***Appendix F10****.*

LAND USE AND SETTLEMENT PATTERNS

The majority of the study area is sparsely populated with a population density of less than 1 person per km^2. The study area consists of a landscape that can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of water. Settlements, where they occur, are usually rural homesteads and farmsteads.

Very few homesteads and settlements are present within the study area. Some of these, in closer proximity to the proposed WEF, include[8]:

- Swartland
- Bon Espirance
- Leeufontein
- Saaiplaas
- Smithkraal
- Ou Mure
- Aanstoot
- Nuwerus
- Fortuin
- Aurora
- Die Bron

It is uncertain whether all of these farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

The predominant land use in the area is stock farming (predominantly sheep, game or goat farming). Since rainfall is low and water is scarce, crop farming accounts for only a small portion of the land use and is largely confined to the more fertile valleys. Due to the low carrying capacity, farms are large and usually at least about 5 km apart.

The R354 arterial road provides motorised access to the region from the N1 national road near Matjiesfontein, the quaint historical town closest to the site (approximately 22km by road to the project site). This road is a local tourism route ultimately leading to Sutherland, the home of the Southern African Large Telescope (SALT). This town and Matjiesfontein are considered to be local tourist attractions/destinations within the region. The Komsberg/Kareedoringkraal secondary or district gravel road provides access to the Komsberg MTS from the R354 arterial road.

Besides the two towns mentioned above, there are no other identified tourist attractions of designated protected areas within the study area.

In spite of the rural and natural character of the study area, there are a number of existing overhead power lines in the study area. These include:

- Droërivier-Kappa (Komsberg) 1 400kV
- Droërivier-Kappa (Komsberg) 2 400kV
- Gamma-Kappa 1 765kV

[8] The names listed are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name.

These power lines all congregate at the Komsberg MTS.

There are also a number of future power lines that have been authorised and/or surveyed, but not yet constructed. Of relevance to this study are the surveyed Hidden Valley-Komsberg 1 and 2 power lines and the authorised Maralla WEF-Komsberg MTS and Esizayo WEF-Komsberg MTS. **Figure 6-39** illustrates the land cover and broad land use patterns for the study area.

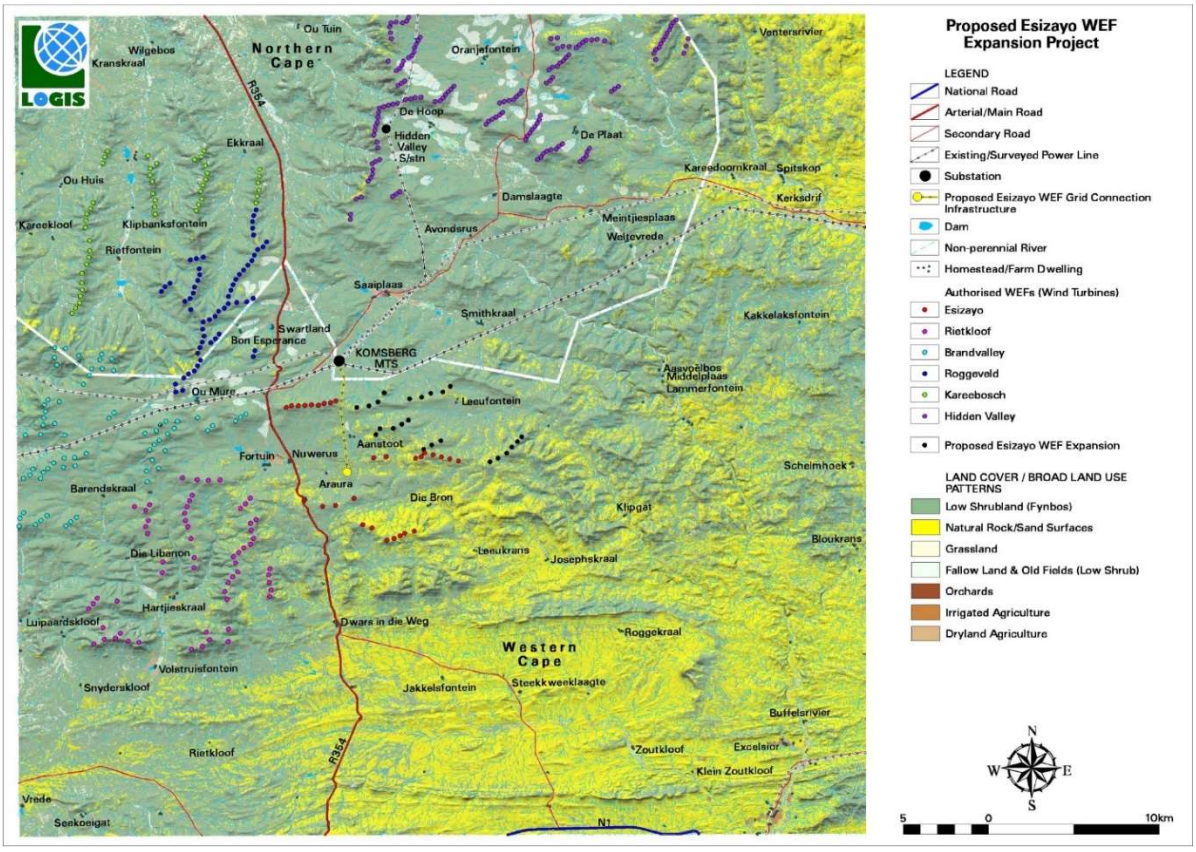


Figure 6-39: Land cover and broad land use patterns (Source: Logis, 2022)

Further to this, the proposed Esizayo WEF Expansion Project is located within the Komsberg Renewable Energy Development Zone (REDZ) and Central Strategic Transmission Corridor. Applications that have been approved (additional to the Esizayo WEF) in the region include:

- Rietkloof WEF
- Hidden Valley WEF (Karusa, Great Karoo & Soetwater)
- Brandvalley WEF
- Roggeveld WEF
- Gunstfontein WEF
- Komsberg WEF
- Maralla East and West WEFs
- Karreebosch WEF
- Sutherland WEF

Figure 6-40 further indicates the status of Renewable Energy Environmental Applications (REEA) within the Komsberg REDZ (dated 2021 1st quarter). It is clear that the region will come under increasing development pressure, and visual intrusion from WEF infrastructure, should all (or most) of the proposed WEFs be constructed.

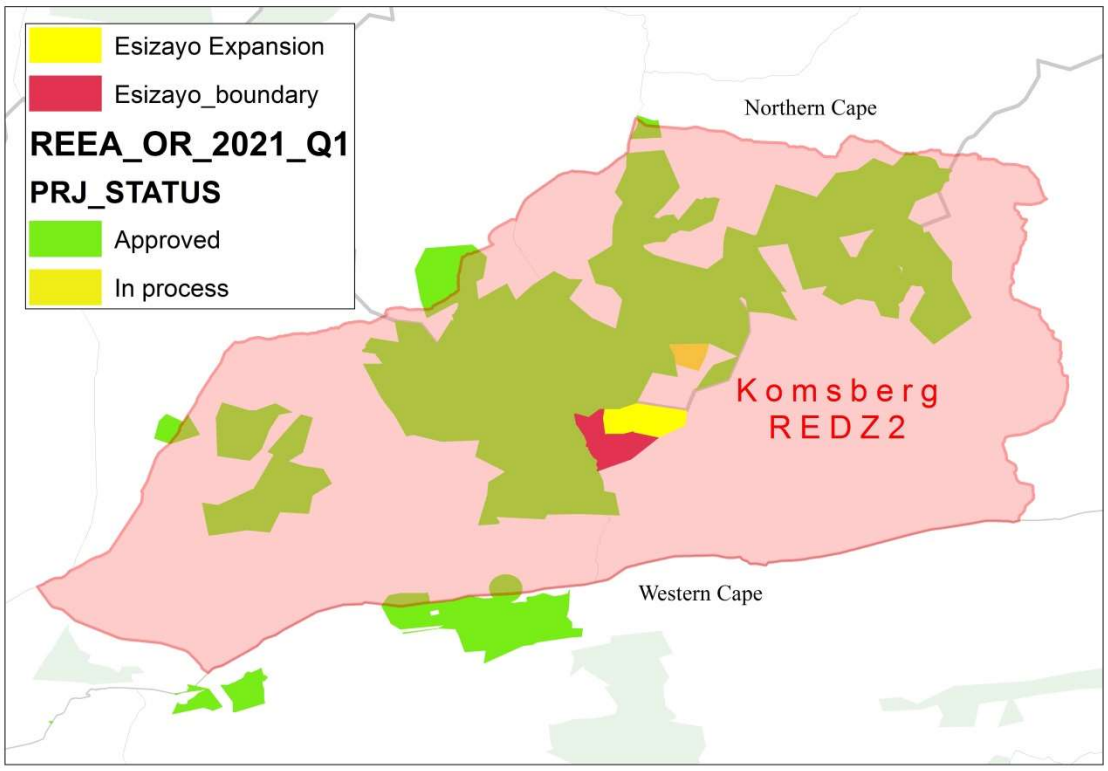


Figure 6-40: Regional locality of the Esizayo WEF in relation to the Komsberg REDZ (Source: Logis, 2022)

POTENTIAL VISUAL EXPOSURE

A visibility analysis was undertaken from each of the wind turbine positions (23 in total) at an offset of 250m (approximate maximum blade-tip-height) above ground level. The result of the visibility analysis is displayed on Map 5.

The result of the viewshed analysis displays the potential areas of visual exposure, as well as the potential frequency of exposure. The frequency of exposure indicates the number of turbines that may be exposed i.e. more turbines may be visible in the darker orange areas than in the yellow areas. Land that is more elevated is typically more exposed to the proposed WEF, whilst lower lying areas such as valleys are shielded, or not as exposed.

The topography of the study area, as was expected, greatly influences the viewshed pattern of the proposed Esizayo WEF Expansion project. The core, uninterrupted area of visual exposure of the wind turbines is largely contained within a 5 - 10km radius of the wind turbine structures. This is due to the Appelfontein se Rant (ridge) to the north and north-east of the proposed development site. The Spitskop and Brandkop hills to the west, the Kranskop, Ramkop and Droëberg hills to the south, and the Losper se Berg, Langkloof se Berg, Kranskop and Bokberg hills to the south-east, similarly contains the visual exposure within a 5 - 10km radius.

Visual exposure within a 10 – 20km radius (to the north-east and east) is largely restricted to the south and west-facing slopes of the mountains and ridges of the Perdeplaas se Berg, Eiffel and Winterbos se Berge. Most of the valleys within this zone are shielded from the wind turbine structures and visual exposure below the Klein-Roggeveldberge escarpment is highly unlikely.

Visibility beyond 20km from the turbine structures will primarily be to the north-east along the south-west-facing slopes of the Langberg, Die Helfte se Berg, Die Kop and Graskop. Visibility to the south, towards the N1 national road, will be contained by the Soutkloof se Berg

The homesteads and roads expected to be visually influenced are listed below. It should be noted that this section of the report focusses only on the potential visual exposure at varying distances and it does not yet refer to visual impact significance or any correlation thereto.

— Less than 5km from the wind turbines:

    - Smithkraal
    - Leeufontein
    - Die Bron
    - Aurora
    - Aanstoot
    - Observers travelling along the R354 arterial road and the Komsberg to Kareedoringkraal secondary road
- Located within a 5 - 10km radius:
    - Saaiplaas
    - Avondsrus
    - Klipgat
    - Josephskraal
    - Leeukrans
    - Nuwerus
    - Fortuin
    - Ou Mure
    - Bon Esperance
    - Swartland
- Located within a 10 - 20km radius:
    - De Hoop
    - Kakkelaksfontein
    - Schelmhoek
    - Zoutkloof
    - Jakkelsfontein
- Located beyond 20km:
    - Not applicable

It is envisaged that the structures, where visible from short to medium distances (e.g. less than 10km), may constitute a high visual prominence, potentially resulting in moderate to high visual impacts.

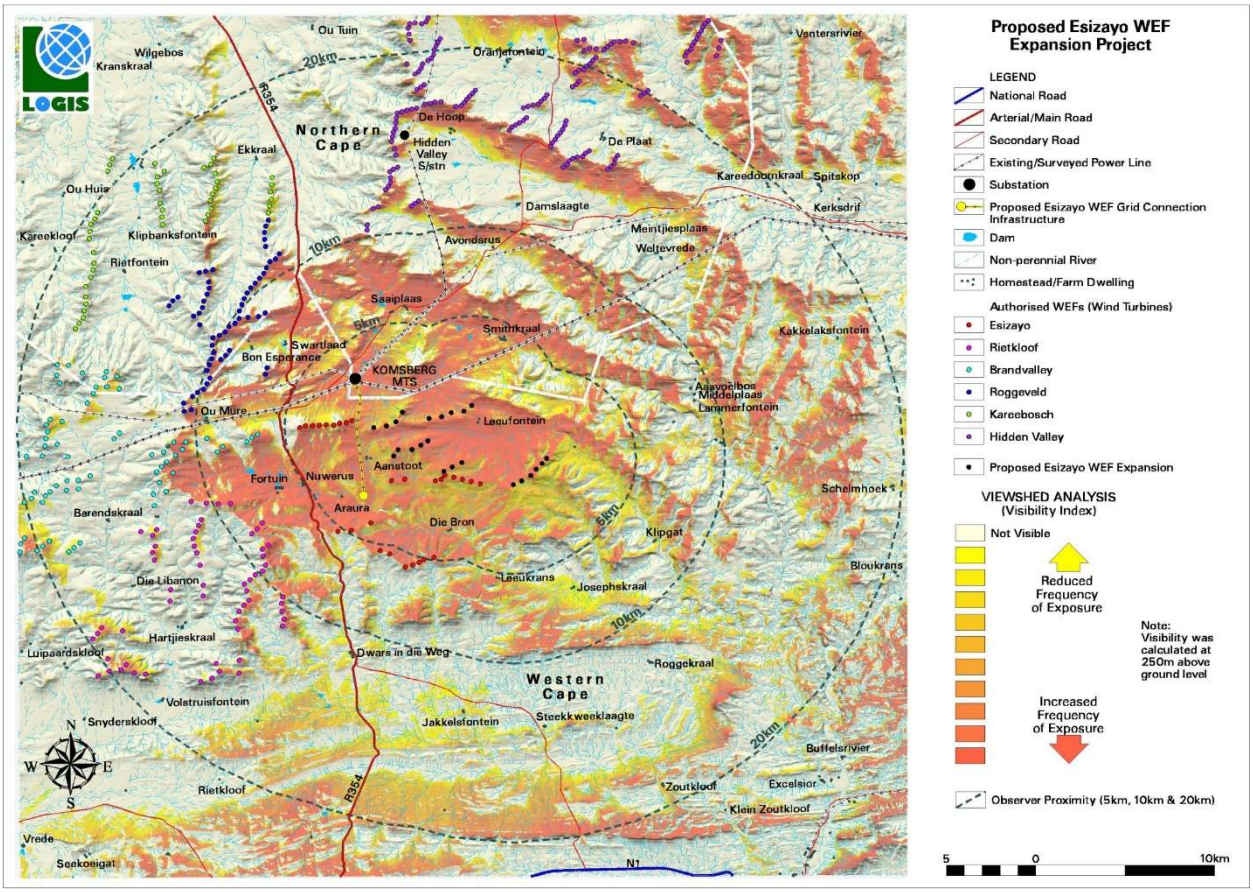


Figure 6-41: Viewshed analysis of the proposed Esizayo WEF Expansion Project (Source: Logis, 2022)

VISUAL DISTANCE / OBSERVER PROXIMITY TO THE GRID CONNECTION INFRASTRUCTURE

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger WEFs (e.g., more than 50 wind turbines) and downwards for smaller WEFs (e.g., less than 50 turbines). This methodology was developed in the absence of any known and/or accepted standards for South African WEFs.

The principle of reduced impact over distance is applied in order to determine the core area of visual influence for these types of structures. It is envisaged that the nature of the structures and the rural character of the study area would create a significant contrast that would make the facility visible and recognisable from greater distances.

The proximity radii for the wind turbines were created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. It should be noted that even though the proximity radii are indicated as (near) concentric circles from the wind turbines, the visual prominence of the structures will only apply where they are visible.

The proximity radii, based on the dimensions of the proposed development footprint are indicated on **Figure 6-42**, and include the following:

- 0 - 5km. Short distance view where the WEF would dominate the frame of vision and constitute a very high visual prominence.
- 5 – 10km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 10 - 20km. Medium to long distance view where the facility would become part of the visual environment but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 20km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility.

VIEWER INCIDENCE / VIEWER PERCEPTION

The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed WEF and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is calculated to be the highest along the public roads within the study area. This includes the R354 arterial road and, to a lesser degree, the Komsberg/Kareedoringkraal secondary road. Travellers using these roads may be negatively impacted upon by visual exposure to the WEF.

Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the study area. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the WEF, would generally be negative.

Due to the remote location of the proposed Esizayo WEF Expansion Project, there are a relatively limited number of potential sensitive visual receptors located within a 20km radius of the proposed facility. These potentially affected sensitive visual receptors are listed in Section 6.1. It is expected that these landowners may experience visual impacts ranging from moderate to high significance, depending on their proximity to the wind turbine structures, and their potential sensitivity (aversion) to wind turbine infrastructure.

Refer to **Figure 6-42** for the location of the potential sensitive visual receptors discussed above.

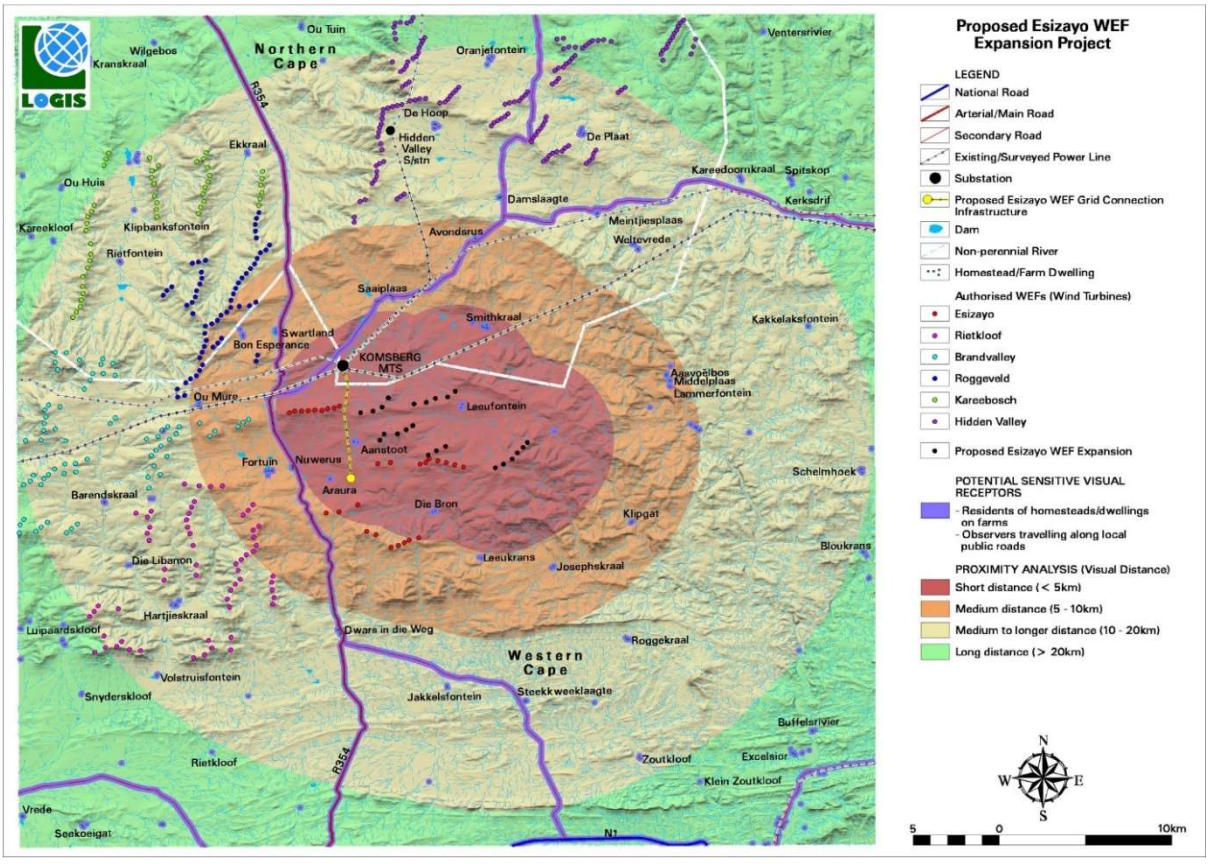


Figure 6-42: Proximity analysis and potential sensitive visual receptors (Source: Logis, 2022)

VISUAL ABSORPTION CAPACITY

The vegetation cover within the study area is predominantly Central Mountain Shale Renosterveld and *Koedoesberge-Moordenaars* Karoo. The land cover types are low shrubland (Fynbos) for most of the study area, with bare sand and rock surfaces in places.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is low by virtue of the limited height (or absence) of the vegetation and the overall low occurrence of buildings, structures and infrastructure. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics. Within this area the VAC of vegetation will not be taken into account, thus assuming a worst case scenario in the impact assessment.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the infrastructure). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

VISUAL IMPACT INDEX

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed Esizayo WEF Expansion Project are displayed on Map 8. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

- The criteria which inform the visual impact index are:
- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential magnitude of the visual impact.

The index indicates that potentially sensitive visual receptors within a 5km radius of the WEF may experience a very high visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; high within a 5 – 10km radius (where/if sensitive receptors are present) and moderate within a 10 – 20km radius (where/if sensitive receptors are present). Receptors beyond 20km are expected to have a low potential visual impact.

Likely areas of potential visual impact and potential sensitive visual receptors located within a 20km radius of the proposed WEF are displayed on **Figure 6-43**.

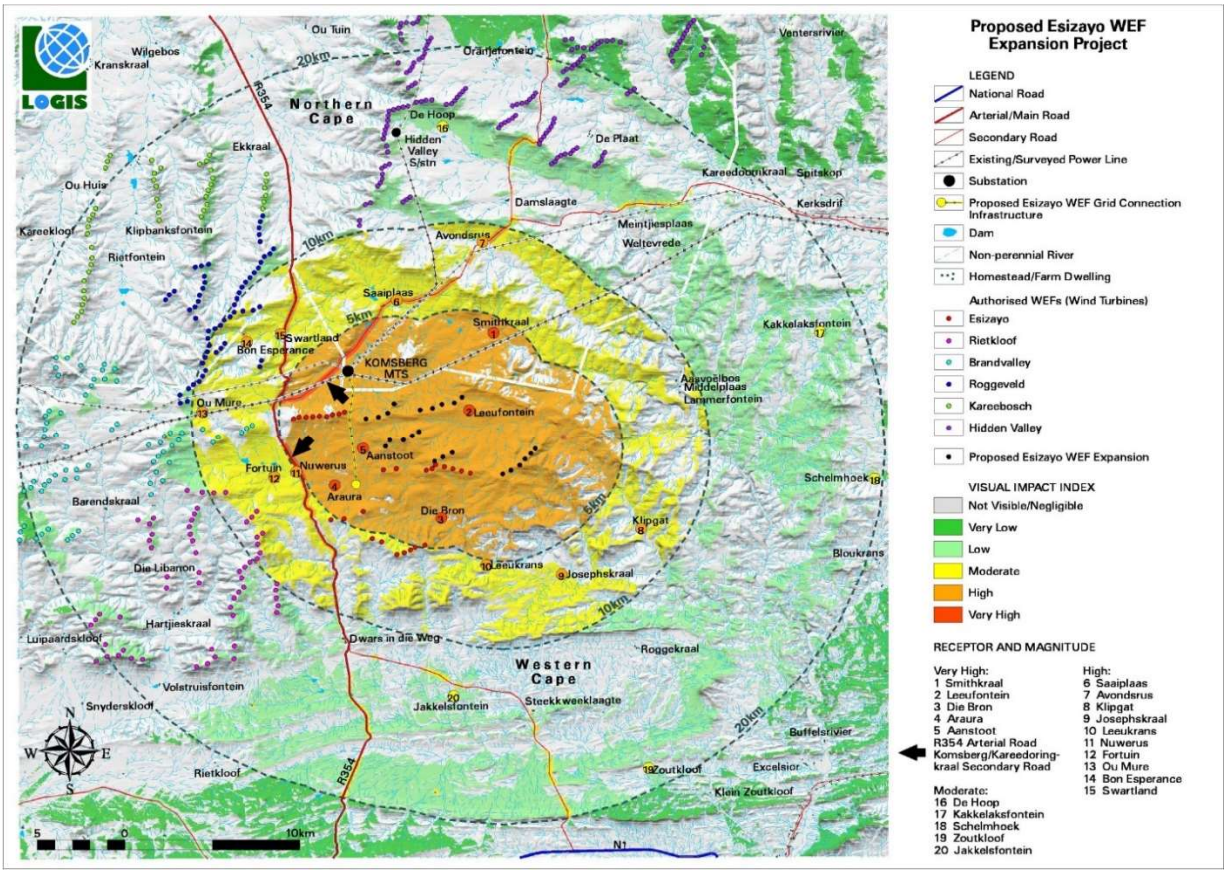


Figure 6-43: Visual impact index and potentially affected sensitive visual receptor (Source: Logis, 2022).

6.2.7 TRAFFIC

The following is extracted from the Traffic Impact Assessment compiled by WSP Group Africa and included as ***Appendix F***9.

ROAD NETWORK DESCRIPTION

The site is located east of the provincial route, road R354 (TR02001). The R354 links National Road N1, approximately 24 km to the south at Matjiesfontein; with Sutherland, approximately 86 km to the north in the Northern Cape Province.

The R354 is a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is regarded as in "Fair" and "Good" condition in the vicinity of the site, as per the Provincial Government of the Western Cape (PGWC) Department of Transport's 2015 Surfaced Road Condition Assessment.

The location of the temporary and/or permanent roads that will be constructed on-site to access each of the turbine sites and support buildings has not been determined. It is however recommended that these internal roads take access off the existing farmstead access roads where possible.

PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT

In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, section 29, it is a requirement that an assessment of public and non-motorised transport be included in a transport impact assessment.

Due to the remote location of the site on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for public transport services or non-motorised transport infrastructure, except for the transport of construction staff.

TRAFFIC FLOWS & TRIP GENERATION

Traffic surveys were sourced from the Western Cape Government Road Network Information System (RNIS), (https://rnis.pgwc.gov.za/rnis/rnis_web_reports).

Counts undertaken during April 2015 confirm very low traffic volumes on the R354, these were escalated to the 2022 and is approximately 150 AADT (Annual Average Daily Traffic). The counts were undertaken on the link between the Western Cape/Northern Cape border and the DR2243 Aprilkraal intersection.

Refer to **Table 6-23** for the expected combined trip generation for the facility during construction.

Table 6-23: Total maximum peak hour trip generation (for vehicle trips per peak hour)

ESIZAYO FACILITY	STAFF (IN : OUT : TOTAL)	MATERIAL DELIVERIES (IN : OUT : TOTAL)	TOTAL (IN : OUT : TOTAL)
Total	31:06:37	04:04:08	**35:10:45**

The above analysis and resultant trip generation represents an unlikely worse- case scenario. The background vehicle volumes along the R354 from where all trips will distribute onto the major road network is low. In conclusion, the transport impact of the facility on the local major road network is expected to be negligible.

6.2.8 NOISE

WIND TURBINES AND NOISE

Noise from wind turbines can be classified into two categories, namely mechanical noise generated from the turbine's mechanical components and aerodynamic noise, produced by flow of air over the turbine blades.

MECHANICAL NOISE

The mechanical noise generated by a wind turbine is predominantly tonal (dominated by a narrow range of frequencies), but may also be broadband in character, displaying a wide range of frequencies (Council of Canadian Academics, 2015). Such noise is produced by the physical movement of the following components:

- Gearbox;
- Generator;
- Yaw drives;
- Cooling fans; and
- Auxiliary equipment.

Over time, appropriate design and manufacturing have reduced the mechanical noise produced from wind turbines. As such, the aerodynamic noise from the blades has become the dominant source of noise for modern turbines, however, low frequency tones associated with mechanical sources are audible for some turbines (Hau, 2006; Manwell *et al.*, 2009; Oerlemans, 2011).

AERODYNAMIC NOISE

Aerodynamic noise is typically broadband in nature and is generated by the interaction between air flow and different parts of the turbine blades. These interactions depend on the speed and turbulence of the wind; the shape of the blade; the angle between the blade and relative wind velocity flowing over the blade; and the distance from the hub. The noise levels produced are relative to the velocity of the air flow, with higher rotor speeds resulting in higher noise levels. Specifically, parts of the blade closer to the tips move faster than those closer to the hub, resulting in faster relative air velocities and create higher aerodynamic noise levels. As such, most of the aerodynamic noise is produced near (but not at) the blade tips. This is partly why turbines with longer blades have a higher sound power level (Oerlemans, 2011).

Aerodynamic noise from wind turbines also has a strong directional component, projecting primarily downward, upward, or even perpendicular depending on the dominant mechanism (Oerlemans, 2011). As such, noise levels measured at a particular location can vary depending on the direction, speed and turbulence of the prevailing wind.

Furthermore, as the rotor turns, the orientation of each blade changes in relation to a stationary receiver. As such, the noise levels at the receiver will vary as the blades rotate, resulting in periodic regular changes in noise levels over time (Renewable UK, 2013).

As wind speed increases, the aerodynamic noise of the turbines also increases. At low speeds the noise created is generally low and increases to a maximum at a certain speed (around 10 m/s) where it either remains constant or can even slightly decrease.

LOW FREQUENCY NOISE AND INFRASOUND

In addition to the noise discussed above, wind turbines also produce some steady, deep, low frequency sounds (between 1 – 100 Hz), particularly under turbulent wind conditions. Sound waves below 20 Hz are called infrasound. These infrasound levels are only audible at very high sound pressure levels. Older wind turbines that had downwind rotors created noticeable amounts of infrasound. Levels produced by modern-day, up-wind style turbines are below the hearing threshold for most people (Jakobsen, 2005).

The human ear is substantially less sensitive to sound at very low or very high frequencies. For most people, a very low pitch sound (20 Hz) must have a sound pressure level of 70 dB to be audible. Levels of infrasound near modern commercial wind turbines are far below this level and are generally not perceptible to people (Leventhall, 2006).

Low frequency sound, like all other sound, decreases as it travels away from the source. Siting wind turbines further away from sensitive receptors will therefore decrease the risk of infrasound. It is, however, important to note that in flat terrain, low frequency sound can travel more effectively than high frequency sound. Most environmental sound measurements and noise regulations are based on the A-weighed decibel scale (dB(A)), which under-weights low frequency sounds in order to mimic the human ear. Thus, noise limits based on the dB(A) levels do not fully regulate infrasound. The dB(C) scale offers an alternative of measuring sound that provides more weight to lower frequencies (Jakobsen, 2005; Bolin *et al*., 2011).

SANS 10103 proposes a methodology to identify whether low frequency noise could be an issue. The method suggests that if the difference between L_{Aeq} and L_{Ceq} is greater than 10 dB, then a predominant low frequency component may be present. However, in all cases the existing acoustic energy in low frequencies associated with wind must be considered.

EXISTING NOISE CLIMATE

The existing noise climate in the area surrounding the proposed wind energy project is typically rural with limited anthropogenic influences. Current sources of noise include livestock, farm equipment, birds, insects and motor vehicles travelling along nearby roads.

SENSITIVE RECEPTORS

Sensitive receptors are identified as areas that may be impacted negatively due to noise associated with the proposed WEF. Examples of receptors include, but are not limited to, schools, shopping centres, hospitals, office blocks and residential areas. Being such a remotely located site, dominant receptors in the area surrounding the site include small farmsteads and farmhouses. Within a 2 km radius of the site, only two specific sensitive receptors (farmhouses) were identified in this study, with details presented in **Figure 6-44** and **Table 6-24**. It is noted that FH A represents the farmhouse receptor (FH 5) used in the original acoustic assessment for the already authorised Esizayo WEF.

Table 6-24: Sensitive receptors surrounding the project site

ID	Description	Latitude (°S)	Longitude (°E)	Nearest Turbine	Distance from Nearest Turbine (m)	Direction from Nearest Turbine
FH A	Farmhouse	32.973131	20.600913	T10	1,520	West
FH B	Farmhouse	32.955828	20.667622	T8	1,005	Southeast

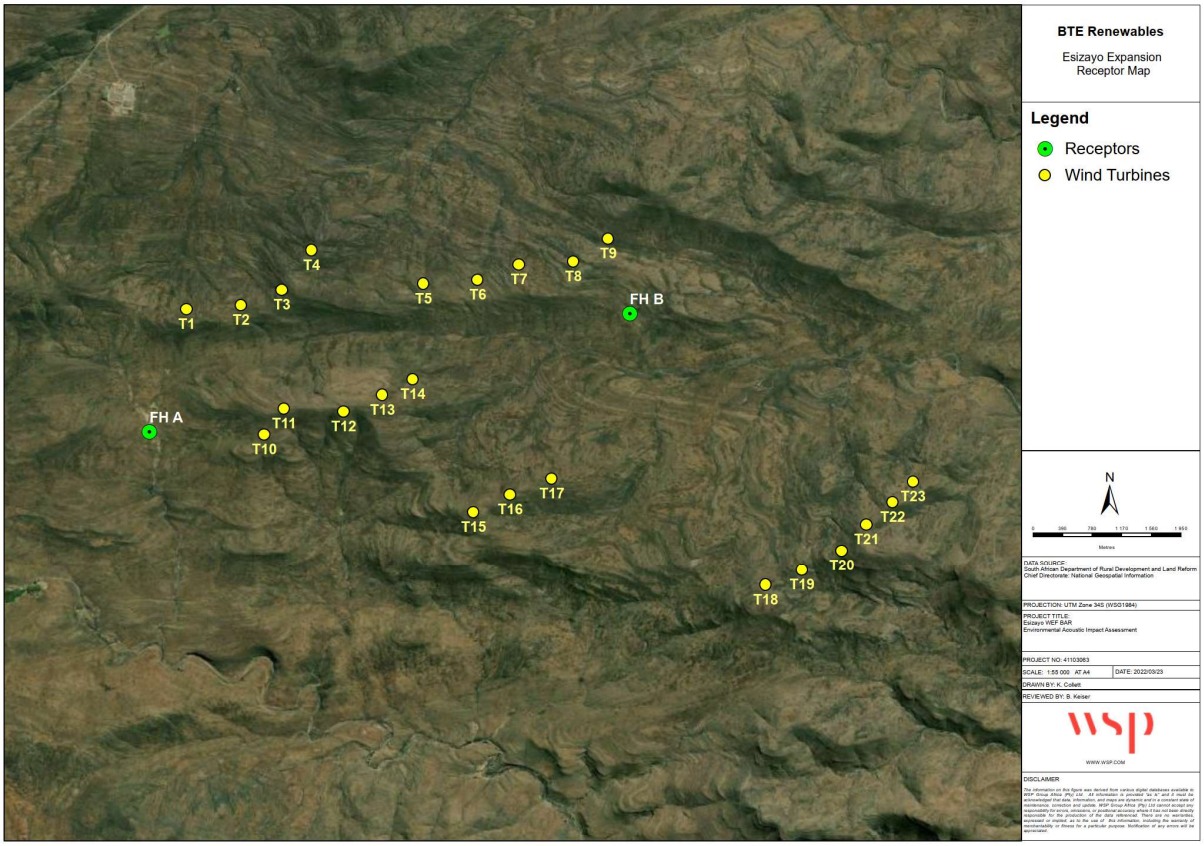


Figure 6-44: Location of Sensitive Receptors

Table 6-25 presents the predicted noise levels from 23 turbines (with a hub height of 150 m and sound power level of 106.0 dB(A)). The model was run taking the surrounding terrain into account. Results indicate that predicted L_{A90} noise levels during both day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at the FH A receptor. As such, no adverse impacts are anticipated and meeting this condition offers sufficient protection of amenity at this receptor. At FH B, however, L_{A90} noise levels are predicted to be slightly above this 35 dB(A) threshold, indicating that noise from the turbines could create a nuisance or impact at this location. It is therefore recommended that the location of the turbines in close proximity of FH B be reconsidered. Such an approach will limit impacts on this receptor and avoid the need for additional, in-depth studies. Alternatively, a more detailed acoustic study will need to be undertaken.

Table 6-25: Predicted noise levels at sensitive receptors

ID	Predicted L_{Aeq} noise level	Predicted L_{A90} noise level	L_{A90} below 35 dB(A)
FH A	33.6	31.6	Yes
FH B	37.9	35.9	No

Note: L_{A90} calculation based on guidance from the ETSU-R-97 report

7 ENVIRONMENTAL IMPACT ASSESSMENT

This Section identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined in **Section 3.5**. The issues identified stem from those aspects presented in **Section 6** of this document as well as the Project description provided in **Section 4**. The impact assessment is based on the preferred alternative at all Project phases. This section only assesses the preferred option along with the no-go alternative. The impact mitigation hierarchy criteria, as per **Section 3.5.2**, for each mitigation measure are indicated in brackets after each measure indicated.

Furthermore, a decommissioning assessment will be considered as part of the decommissioning process that will be subject to a separate authorisation and impact assessment process. Any decommissioning impacts will be assessed at this stage. The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GNR 326.

7.1 AIR QUALITY

7.1.1 CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER

The National Dust Control Regulations (GNR 827) prescribe general measures for the control of dust in both residential and non-residential areas and will be applicable during construction of the WEF. **Table 7-1** provides the acceptable dust fall rates as prescribed by GNR 827.

Table 7-1: Acceptable dust fall rates (GNR 827)

RESTRICTION AREAS	DUST FALL RATE (D) (mg/m^2/day – 30 DAYS AVERAGE)	PERMITTED FREQUENCY OF EXCEEDING DUST FALL RATE
Residential area	D < 600	Two within a year, not sequential months
Non-residential area	600 < D < 1200	Two within a year, not sequential months

During the construction phase, dust and vehicular emissions (carbon monoxide (CO), hydrocarbons, particulate matter (PM) and nitrogen oxides (NO_x) will be released as a result of vegetation clearing activities, transportation of equipment and materials to site, and the installation thereof, all of which involves the movement of large plant and trucks along unpaved roads and exposing of soils. The emissions will, however, have short-term impacts on the immediate surrounding areas that can be easily mitigated and thus the authorisation of such emissions will not be required. All construction phase air quality impacts will be minimised with the implementation of dust control measures contained within the EMPr (**Appendix G**).

The impact of the construction phase on the generation of dust and particulate matter (PM) is shown in **Table 7-2**.

Table 7-2: Construction Impact on Generation of Dust and PM

Potential Impact / GENERATION OF DUST AND PM	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	2	3	1	4	**32**	**Moderate**	(-)	High
With Mitigation	1	1	3	1	3	**18**	**Low**	(-)	High

Potential Impact GENERATION OF DUST AND PM	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
Mitigation and Management Measures	— Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and soil/material stockpiles especially. This includes wetting of exposed soft soil surfaces and not conducting activities during high wind periods which will increase the likelihood of dust being generated; — All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres; — Ensure that all vehicles, machines and equipment are adequately maintained to minimise emissions; — It is recommended that the clearing of vegetation from the site should be selective, be kept to the minimum feasible area, and be undertaken just before construction so as to minimise erosion and dust potential; — All materials transported to, or from, site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. — Enforcing of speed limits. Reducing the dust generated by the listed activities above, putting up signs to enforce speed limit in access roads. — No burning of waste, such as plastic bags, cement bags and litter is permitted; and — All issues/complaints must be recorded in the complaints register.							

7.1.2 OPERATIONAL PHASE

There are no anticipated air quality impacts during the operational phase as maintenance activities will occur as and when required and will be extremely short term.

7.1.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.2 NOISE

7.2.1 CONSTRUCTION PHASE

Elevated noise levels are likely to be generated by the construction activities (machinery and vehicles) and the workforce. It is important to note that noise impacts (nuisance factor) may vary in the different areas as a result of the surrounding land uses and will be temporary in nature. Due to the temporary and limited nature of the Project activities, coupled with the fact that there are a limited number of noise receptors around the Project area, the impact is regarded as low. The construction impact on noise is indicated in **Table 7-3**.

Table 7-3: Construction Impact on Noise

Potential Impact: NOISE EMISSIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	3	1	4	**28**	**Low**	(-)	High

Potential Impact: / NOISE EMISSIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
With Mitigation	2	1	1	1	3	**15**	**Very Low**	(-)	High
Mitigation and Management Measures	— The equipment must be in maintained in good working order, within service dates, and inspected before use; — Align working times with the substation related operational times; and — Install noise reducing fittings on machinery (if required).								

7.2.2 OPERATIONAL PHASE

Key localised acoustic impacts associated with the project include:

— Operational phase impacts of noise on sensitive receptor FH A; and
— Operational phase impacts of noise on sensitive receptor FH B.

Outcomes of the noise assessment are contained within **Table 7-4** and **Table 7-5** outlining the impact of each parameter and the resulting risk level. The resultant environmental acoustic risks for sensitive receptor FH A were ranked "low", while for sensitive receptor FH B, risks were ranked "low to medium". Acoustic impacts of WEFs are very site-specific and the impacts are directly assessed using predicted L_{A90} levels at nearby receptors. The different wind energy developments in the region are located in different areas with their own set of receptor locations. If the impacts on the receptors at the Esizayo site are low, then the impact from the other WEFs on these receptors will be significantly lower based on distance from the source.

Table 7-4: Operational Impact of Noise on Farmhouse A

Potential Impact: / NOISE EMISSIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	1	1	1	3	4	**24**	**Low**	(-)	High
With Mitigation	1	1	1	3	3	**18**	**Low**	(-)	High
Mitigation and Management Measures	— Operating turbines in reduced noise mode should any complaints be received; — Building walls/appropriate noise barriers around potentially affected buildings; — Limiting turbine operations above the wind speed at which turbine noise becomes unacceptable in the project-specific circumstances; — Ensuring a larger setback distance from potentially sensitive receptor locations; and — Consideration of installing larger capacity wind turbines, limiting the number of turbines to be installed but having the same power generation potential								

Table 7-5: Operational Impact of Noise on Farmhouse B

Potential Impact: / NOISE EMISSIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	1	1	3	4	**36**	**Moderate**	(-)	High
With Mitigation	2	1	1	3	3	**21**	**Low**	(-)	High

Potential Impact: NOISE EMISSIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
Mitigation and Management Measures	— Noise levels at the FH B receptor are, however, elevated and re-location of the nearby turbines should be considered — Operating turbines in reduced noise mode should any complaints be received; — Building walls/appropriate noise barriers around potentially affected buildings; — Limiting turbine operations above the wind speed at which turbine noise becomes unacceptable in the project-specific circumstances; — Ensuring a larger setback distance from potentially sensitive receptor locations; and — Consideration of installing larger capacity wind turbines, limiting the number of turbines to be installed but having the same power generation potential							

7.2.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.3 SOIL EROSION AND CONTAMINATION

7.3.1 CONSTRUCTION PHASE

SOIL EROSION

Clearing of vegetation, movement of vehicles, mobile plant and equipment, as well as earthworks required for establishment of the towers is very likely to result in increased loose material being exposed. As mentioned, the soil that is present is apedal, so devoid of macrostructure, making erosion more likely than it would be on well-structured soils. Having said this, much of the soil surface is bare currently and some erosion does occur continually. As there are watercourses crossing the site, the potential impact of sedimentation is linked to that of erosion. Although the magnitude and extent of erosion and sedimentation are likely to be limited if the recommended mitigation measures are properly implemented, some erosion is likely when clearing an area and erosion and sedimentation are not easily reversible. Mitigation should focus on limiting vegetation removal as far as possible, as the vegetative cover binds the soil particles. Earthworks and vehicle movement should be limited to demarcated areas and the duration of the construction activities should be limited where possible. If soil stripping is required, this should be undertaken in the dry season and silt fences erected if unexpected weather washes loose soil into the watercourses.

The construction impact on soil erosion is indicated in **Table 7-6**.

Table 7-6: Construction impact of soil erosion and sedimentation

Potential Impact: SOIL EROSION AND SEDIMENTATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	5	5	5	**75**	**High**	(-)	High
With Mitigation	1	1	3	2	3	**21**	**Low**	(-)	High

Mitigation and Management Measures	— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit the duration of construction activities where possible, especially those involving earthwork / excavations. — Access roads associated with the development should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for. — Removal of vegetation must be avoided and exposed surfaces and should be re-vegetated or stabilised as soon as is practically possible. — A storm water management plan should be designed for the site and adhered-to. — Soil stripping should be undertaken in the dry season, if necessary, and silt fences erected if unexpected weather washes loose soil into the relatively nearby watercourse.

CHANGE IN SURFACE PROFILE

Earthworks required for establishment of the turbines, as well as establishment of access tracks, may result in the change of surface profile within the project area.

A change in the surface profile is typically inevitable with earthworks, is long-term or permanent in duration, definite and cannot be easily mitigated against. Having said this, the physical extent of the earthworks is likely to be small, and the site comprises rock and shallow, stony soils overlying rock. Even though the extent of the impact is small, within the context of the impact assessment rating methodology the calculated significance with mitigation is a 'moderate' negative. Despite this, it is the specialist's opinion that the significance of this change in surface profile in the context of this project is 'low'. For this reason an alternative impact assessment system was also applied to this potential impact.

During construction activities, construction vehicles/trucks/machinery as well as hazardous substances stored on the site might spill and contaminate the soil. The impact of the construction phase on change in surface profile is indicated in **Table 7-7**.

Table 7-7: Construction Impact on change in surface profile

Potential Impact: **CHANGE IN SURFACE PROFILE**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	1	5	5	4	**64**	**High**	(-)	Low
With Mitigation	4	1	3	4	3	**36**	**Moderate**	(-)	Low
Mitigation and Management Measures	— Opting for tower positions where a smaller profile change is necessary — When the site is decommissioned, the surface profile thereof can be altered to more closely resemble its current profile through earthworks								

As seen in **Table 7-8**, the alternative system shows pre- and post-mitigation significance as a negative 'low'. This is as a result of the magnitude of the change in surface profile being considered very low as the processes underway at the site do not provide important community functions currently. The area appears to be home to at least one tortoise, but it is believed that the introductions of the WEF turbines and associated will not affect the soil in such a way that this will affect the tortoise habitat. Direct effects of the introduction of the WEF turbines and associated infrastructure on fauna were not considered within this study.

Table 7-8: Construction Impact on change in surface profile (Alternative system)

Potential Impact: / CHANGE IN SURFACE PROFILE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	1	5	5	4	44	Moderate	(-)	Med
With Mitigation	4	1	3	4	3	24	Low	(-)	Med

CHANGE IN LAND USE

Clearance of vegetation on site and establishment of infrastructure will result in a change of land use within the project area, which will continue through construction and operation. The land currently houses tufts of natural grass, bare rock and bare soil. The proposed project will result in a change in land use to host overhead powerline poles, so there will be a change, even though the land is hardly used currently. The degree of alteration is very high (i.e. complete change in land use), the change will definitely take place and will be irreversible for the duration of the project life (i.e. the impact will take place in the construction phase but will remain as long as the project infrastructure is in place).

Even though the extent is small, within the context of the impact assessment rating methodology the calculated significance is a 'moderate' negative. With implementation of mitigation measures that include limited disturbance and removal of vegetation, the impact remains 'moderate', even though the current land use can be recovered without rehabilitation. It is however the specialist's opinion that the significance of this change in land use is low, as the current land use is very limited. For this reason, an alternative impact assessment system was also applied to this potential impact. The impact of the construction phase on change in land use is indicated in **Table 7-9**.

Table 7-9: Construction Impact on change in land use

Potential Impact: / CHANGE IN LAND USE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	1	4	5	40	Moderate	(-)	Low
With Mitigation	1	1	1	4	5	35	Moderate	(-)	Low
Mitigation and Management Measures	— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit removal of vegetation to demarcated areas only. — Rehabilitate disturbed areas around the poles as soon as practicable following disturbance thereof.								

As seen in **Table 7-10**, the alternative system shows pre- and post-mitigation significance as a negative 'low'. This is as a result of the magnitude of the change in the land use being considered negligible as the site currently houses areas of bare rock and soil and tufts of natural grass.

Table 7-10: Construction Impact on change in land use (Alternative system)

Potential Impact: / CHANGE IN LAND USE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	1	1	1	4	5	30	Low	(-)	Med
With Mitigation	1	1	1	4	5	30	Low	(-)	Med

SOIL CONTAMINATION

Movement of vehicles and equipment on site could result in leaks, spills of hazardous materials, such as fuels, oils and chemicals. Contaminated soil is expensive to rehabilitate and contamination entering the soils of the

project area infiltrate into the ground as well as migrate into onsite watercourses and from site during rainfall events. With the correct implementation of mitigation measures, the probability, extent and duration of the impact can be reduced, thereby reducing the potential impact from a 'high' negative to 'low'. The impact of the construction phase on soil contamination is indicated in **Table 7-11**.

Table 7-11: Construction Impact on soil contamination

Potential Impact: SOIL CONTAMINATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	3	3	5	5	**70**	**High**	(-)	High
With Mitigation	3	1	3	2	2	**18**	**Low**	(-)	Med
Mitigation and Management Measures	— On-site vehicles should be well-maintained, — Drip trays should be placed under stationary vehicles / plant; — On-site pollutants/hazardous materials should be contained in a bunded area and on an impermeable surface; — Ensure proper control of dangerous substances entering the site; — Adequate disposal facilities should be provided, and — A non-polluting environment should be enforced.								

7.3.2 OPERATIONAL PHASE

The identified impacts to soil take place during the construction phase but the impact can still be felt throughout the operation phase. The potential impact to focus on during the operation phase is Erosion and Sedimentation.

SOIL EROSION AND SEDIMENTATION

Although the site is likely to only be directly affected during the operational phase by occasional maintenance, ongoing erosion and consequent sedimentation throughout the operational phase of the project should be monitored and mitigated against. As mentioned, the soil is apedal, so devoid of macrostructure, making erosion more likely than it would be on well-structured soils, especially once disturbed during the construction phase. As there are watercourses crossing the site, the potential impact of sedimentation is linked to that of erosion.

Mitigation should focus on erosion and sedimentation monitoring and management.

The impact on soil erosion and sedimentation during the operational phase is indicated in **Table 7-12**.

Table 7-12: Soil erosion and sedimentation associated with the operational phase

Potential Impact: SOIL EROSION AND SEDIMENTATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	2	5	5	5	**70**	**High**	(-)	High
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)	Med
Mitigation and Management Measures	— The site should be monitored for signs of erosion continually and an erosion management plan should be put in place.								

7.3.3 DECOMMISSIONING PHASE

As mentioned, no plans to decommission the site are underway currently and decommissioning of the infrastructure will require a separate authorization. Having said this, the decommissioning phase will be similar to the construction phase as large vehicles will be on site and earth will be moved. Erosion and Sedimentation,

and Soil Contamination are the most likely negative impacts. The potential impact can again be reduced from a negative 'High' to 'Low' if mitigation measures are properly implemented and progress monitored.

7.4 FRESHWATER

7.4.1 CONSTRUCTION PHASE

The following activities will be carried out during the construction of the Project:

- Vegetation clearing and construction of access roads/tracks (where required);
- Construction of Turbine structure foundations;
- Assembly and erection of infrastructure on site; and
- Rehabilitation of disturbed areas and protection of erosion sensitive areas.

ALTERATION OF THE NATURAL FLOW REGIME

The construction of access roads and laydown areas may result in alterations to the natural flow regimes through increased runoff, water abstractions or flow diversions. The **Alteration of the Natural Flow Regime** impact during construction is shown in **Table 7-13**.

Table 7-13: Alteration of the Natural Flow Regime associated with the construction impact on Wetlands

Potential Impacts: ALTERATION OF THE NATURAL FLOW REGIME	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	2	3	36	**Moderate**	(-)	High
With Mitigation	2	2	2	2	3	24	**Low**	(-)	High
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed. — No water should be abstracted from the wetland area. Ideally water required during the construction phase must be sourced from an external source (i.e. outside of the wetland contributing area). — Existing access routes should be utilised. Should access roads need to traverse watercourse, these should be perpendicular to the watercourse with appropriately designed culverts. — It is recommended that, where possible, laydown areas and construction camps are to be developed outside the riparian zone or 100m from a watercourse, whichever is greatest. — The pole sites should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season. — If possible, construction activities should be undertaken during the dry season.								

WATER QUALITY

Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems. The impact on **Water Quality** is shown in **Table 7-14**.

Table 7-14: Construction impact on water quality of wetlands

Potential Impacts: WATER QUALITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	1	2	4	36	**Moderate**	(-)	High
With Mitigation	2	2	1	2	3	21	**Low**	(-)	High
Mitigation and Management Measures	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Procedures for containment of leaks/spills as well as associated emergency response plans should be developed. — Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the riparian zone or 100m from a watercourse, whichever is greatest. — Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks. — Adequate ablution facilities should be developed and located outside the riparian zone or 100m from a watercourse, whichever is greatest.								

LOSS OF WETLAND AND RIPARIAN FUNCTIONALITY

ASSOCIATED INFRASTRUCTURE

Degradation of wetland/riparian habitat due to the positioning of the associated infrastructure. The impact on **loss of wetland and riparian functionality** is shown in **Table 7-15**.

Table 7-15: Loss of wetland and riparian functionality associated with the construction impact on wetlands due to infrastructure

Potential Impacts: LOSS OF WETLAND AND RIPARIAN FUNCTIONALITY (ASSOCIATED INFRASTRUCTURE)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	44	**Moderate**	(-)	High
With Mitigation	3	2	2	2	2	18	**Low**	(-)	High
Mitigation and Management Measures	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest. — A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be								

Potential Impacts: LOSS OF WETLAND AND RIPARIAN FUNCTIONALITY (ASSOCIATED INFRASTRUCTURE)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
	indicated on this plan together with erosion and sediment, controls and measures. — Stringing should make use of a running block and span, limiting intrusion into the freshwater habitat systems. — The pole sites should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities. — The identified wetlands and riparian areas are to be designated as "highly sensitive". — Planning the location of towers should factor in the wetlands and riparian areas, with pole placement taking place outside these systems. — In the event that towers need to be placed within the wetland or riparian systems, an application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) must be undertaken.								

ACCESS ROADS

Degradation of wetland/riparian habitat due to the need for access roads. The impact on **Loss of wetland and riparian functionality** is shown in **Table 7-16**.

Table 7-16: Loss of wetland and riparian functionality associated with the construction impact on wetlands due to access roads

Potential Impacts: LOSS OF WETLAND AND RIPARIAN FUNCTIONALITY (ACCESS ROADS)	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	2	4	44	**Moderate**	(-)	High
With Mitigation	3	2	1	2	3	24	**Low**	(-)	High
Mitigation and Management Measures	— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures. — The identified wetlands and riparian areas are to be designated as "highly sensitive". — Existing access routes must be utilised. — Should the need for additional access routes arise, these should be perpendicular to the watercourse and developed with appropriately sized culvers. — In the event that access roads need to be constructed, an application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) must be undertaken								

SOIL EROSION

Increased soil erosion due to vegetation clearance, soil disturbance and high traffic movement on site. Subsequent potential sedimentation of watercourses. The construction impact on **increased soil erosion and sedimentation** is indicated in **Table 7-17**.

Table 7-17: Soil erosion and sedimentation associated with the construction impact on wetlands

Potential Impact: SOIL EROSION AND SEDIMENTATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	(-)	High
With Mitigation	2	2	1	2	3	**21**	**Low**	(-)	High
Mitigation and Management Measures	— During the construction phase sediment control measures must be adopted in order to prevent sediment entering the wetland. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season. — Traffic of construction vehicles should be kept to a minimum to reduce soil compaction and limited to existing or proposed roadways where practical. — Soils excavated during construction of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles). — Upon completion of construction, the laydown areas and construction camp sites are to be rehabilitated. — Gabions or Reno Mattresses should be used where evidence of erosion is present.								

ALIEN VEGETATION ESTABLISHMENT

There is a potential for alien vegetation to colonise impacted areas. The impact on **Alien vegetation establishment** is shown in **Table 7-18**.

Table 7-18: Alien vegetation establishment associated with the construction impact on wetlands

Potential Impacts: ALIEN VEGETATION ESTABLISHMENT	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	1	2	3	27	**Low**	(-)	High
With Mitigation	2	2	1	2	2	14	**Very Low**	(-)	High
Mitigation and Management Measures	— It is essential that all alien invasive species be removed from the disturbed/construction area. — As part of the rehabilitation initiatives, an alien removal and monitoring plan should be established that addresses alien vegetation in the wetland areas. The programme is to include regular clearing of alien vegetation and monitoring thereof to assess the success of activities and recommend additional measures if required. Alien vegetation removal and monitoring is to be implemented based on the plan.								

7.4.2 OPERATIONAL PHASE

WATER QUALITY

Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems. The impact on **Water Quality** is shown in **Table 7-19**.

Table 7-19: Operational impact on water quality of wetlands

Potential Impacts: / WATER QUALITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	1	2	3	27	**Low**	(-)	High
With Mitigation	2	2	1	2	1	7	**Very Low**	(-)	High
Mitigation and Management Measures	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Procedures for containment of leaks/spills as well as associated emergency response plans should be developed. — Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the riparian zone or 100m from a watercourse, whichever is greatest. — Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks. — Adequate ablution facilities should be developed and located outside the riparian zone or 100m from a watercourse, whichever is greatest.								

LOSS OF WETLAND AND RIPARIAN HABITAT

Degradation of wetland/riparian habitat when undertaking maintenance activities. The impact on **loss of wetland and riparian habitat** is shown in **Table 7-20.**

Table 7-20: Loss of wetland and riparian habitat associated with the operational impact

Potential Impacts: / LOSS OF WETLAND AND RIPARIAN HABITAT	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	2	22	**Low**	(-)	High
With Mitigation	2	2	1	2	1	7	**Very Low**	(-)	High
Mitigation and Management Measures	— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures. — The identified wetlands and riparian areas are to be designated as “highly sensitive”.								

Potential Impacts:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
LOSS OF WETLAND AND RIPARIAN HABITAT								
	— Existing access routes should be utilised to access the powerline infrastructure.							

SOIL EROSION

Increased soil erosion due to vegetation clearance, soil disturbance during maintenance activities. Subsequent potential sedimentation of watercourses. The operational impact on **increased soil erosion and sedimentation** is indicated in **Table 7-21**.

Table 7-21: Soil erosion and sedimentation associated with the operational impact on wetlands

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
SOIL EROSION AND SEDIMENTATION									
Without Mitigation	3	2	3	2	2	**20**	**Low**	(-)	High
With Mitigation	2	2	1	2	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures	— During maintenance, sediment control measures must be adopted in order to prevent sediment entering the wetland. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season. — Traffic of maintenance vehicles should be kept to a minimum to reduce soil compaction and limited to existing or proposed roadways where practical. — Soils excavated during maintenance of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles). — Upon completion of maintenance, the laydown areas and construction camp sites are to be rehabilitated. — Gabions or Reno Mattresses should be used where evidence of erosion is present.								

7.4.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.5 HYDROLOGY

7.5.1 CONSTRUCTION PHASE

ALTERATION OF THE NATURAL FLOW REGIME

The construction of phase of the Project and associated infrastructure, including temporary laydown areas and access roads may result in alterations to the natural flow regimes through increased runoff, water abstractions or flow diversions. The **Alteration of the Natural Flow Regime** impact during construction is shown in **Table 7-22**.

Table 7-22: Alteration of the Natural Flow Regime associated with the construction impact

Potential Impacts: ALTERATION OF THE NATURAL FLOW REGIME	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	2	4	48	**Moderate**	(-)	High
With Mitigation	2	2	1	2	3	21	**Low**	(-)	High
Mitigation and Management Measures	— No water should be abstracted from the watercourses. Ideally water required during the construction phase must be sourced from an external source (i.e. outside of the wetland contributing area). — Existing access routes should be utilised. Should access roads need to traverse watercourse, these should be perpendicular to the watercourse with appropriately designed culverts. — Should any powerlines or roads need to traverse a watercourse, these should be perpendicular to the watercourse. The associated foundations should be located outside the extent of the watercourse. — It is recommended that, where possible, laydown areas and construction camps are to be developed outside the extent of the watercourse. — The construction site should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season. — If possible, construction activities should be undertaken during the dry season.								

SOIL EROSION

Construction activities will result in soil disturbance, resulting in a higher potential for soil erosion and sedimentation. The construction impact on **increased soil erosion and sedimentation** is indicated in **Table 7-23**.

Table 7-23: Soil erosion and sedimentation associated with the construction impact

Potential Impact: SOIL EROSION AND SEDIMENTATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	3	3	39	**Moderate**	(-)	High
With Mitigation	3	2	1	2	2	16	**Low**	(-)	High
Mitigation and Management Measures	— During the construction phase sediment control measures must be adopted in order to prevent sediment entering the watercourses. These include limiting the area of disturbance, the use of silt fences and the covering of stockpiles. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season.								

	— Traffic of construction vehicles should be kept to a minimum to reduce soil compaction and limited to existing or proposed roadways where practical. — Soils excavated during construction of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles). — Upon completion of construction, the laydown areas and construction camp sites are to be rehabilitated. — Gabions or Reno Mattresses should be used where evidence of erosion is present.

WATER QUALITY

Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles and machinery. The impact on **Water Quality** is shown in **Table 7-24**.

Table 7-24: Construction impact on water quality degradation

Potential Impacts: WATER QUALITY DEGRADATIONH	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	2	4	48	**Moderate**	(-)	High
With Mitigation	2	2	1	2	3	21	**Low**	(-)	High
Mitigation and Management Measures	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the extent of the watercourse. — Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are outside the extent of the watercourse. — Procedures for containment of leaks/spills (spill response plan) as well as associated emergency response plans should be developed. — Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the extent of the watercourse. — Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks. — Adequate ablution facilities should be developed and located outside the extent of the watercourse.								

7.5.2 OPERATION PHASE

ALTERATION OF THE NATURAL FLOW REGIME

During the operational phase of the project, maintenance of the infrastructure may be undertaken. Additional infrastructure may also be added The **Alteration of the Natural Flow Regime** impact during operation is shown in **Table 7-25**.

Table 7-25: Alteration of the Natural Flow Regime associated with the operational impact

Potential Impacts: ALTERATION OF THE NATURAL FLOW REGIME	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	44	**Moderate**	(-)	High
With Mitigation	2	2	1	2	3	21	**Low**	(-)	High
Mitigation and Management Measures	— No water should be abstracted from the watercourses. Ideally water required during the construction phase must be sourced from an external source (i.e. outside of the watercourse contributing area). — Existing access routes should be utilised. Should access roads need to traverse watercourse, these should be perpendicular to the watercourse with appropriately designed culverts. — Should any powerlines or roads need to traverse a watercourse, these should be perpendicular to the watercourse. The associated foundations should be located outside the extent of the watercourse.								

SOIL EROSION

Maintenance activities will result in soil disturbance, resulting in a higher potential for soil erosion and sedimentation. The operational impact on **increased soil erosion and sedimentation** is indicated in **Table 7-26**.

Table 7-26: Soil erosion and sedimentation associated with the operational impact

Potential Impact: SOIL EROSION AND SEDIMENTATION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	3	**33**	**Moderate**	(-)	High
With Mitigation	3	1	1	2	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures	— During the construction phase sediment control measures must be adopted in order to prevent sediment entering the watercourses. These include limiting the area of disturbance, the use of silt fences and the covering of stockpiles. — The project site should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities. — The use of rock mattresses at the culver discharge points. — The use of supporting structures such as gabions around the foundations of any pipeline or powerline crossings to prevent any scouring of the base.								

WATER QUALITY

Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles, and sewage from on-site sanitation systems. Spillages from onsite dirty water containment facilities. The impact on **Water Quality** is shown in **Table 7-27.**

Table 7-27: Operational impact on water quality degradation

Potential Impacts: WATER QUALITY DEGRADATIONH	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	48	**Moderate**	(-)	High
With Mitigation	3	2	1	2	2	16	**Low**	(-)	High
Mitigation and Management Measures	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the extent of the watercourse. — Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are outside the extent of the watercourse. — Procedures for containment of leaks/spills (spill response plan) as well as associated emergency response plans should be developed. — Stormwater management should be in line with the stormwater management plan. — Dirty water retention facilities must be designed to adequately capture contaminated water. Should this water be released, provisions for adequate treatment must be made. — Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the extent of the watercourse. — Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks. — Adequate ablution facilities should be developed and located outside the extent of the watercourse.								

7.5.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.6 BIODIVERSITY

Considering the anthropogenic activities and influences within the landscape, several existing negative impacts to biodiversity were observed within the PAOI and the surrounding landscape. These include:

— Livestock grazing land-use leading to trampling and exacerbated erosion;
— Persecution of carnivores;
— Roads and associated vehicle traffic leading to road kills;
— Predator-proof fences; and
— Existing Energy Facilities in the surrounding landscape.

7.6.1 CONSTRUCTION PHASE

LOSS OF HABITAT DUE TO INFRASTRUCTURE DEVELOPMENT

The proposed development will result in the loss of habitat due to associated infrastructure such as turbines, substation, powerlines and internal roads. The proposed infrastructure will result in the loss of approximately 200 ha of habitat. The significance of the impact is shown in **Table 7-28**.

Table 7-28: Assessment of significance of habitat loss associated with the construction phase of the proposed development.

Potential Impact: DESTRUCTION, FURTHER LOSS AND FRAGMENTATION OF HABITATS, ECOSYSTEMS & VEGETATION COMMUNITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	5	5	75	High	(-)	High
With Mitigation	5	1	3	5	4	56	Moderate	(-)	High
Mitigation and Management Measures	— Designs capacity must be kept to a minimum feasibility in Very High SEI areas, with set-aside areas created in support of conservation — The areas to be developed must be specifically demarcated to prevent movement into surrounding environments. To compensate for the loss in biodiversity, the surrounding areas should be used as set-aside areas in discussion with the landowners and the relevant conservation authority. — Minimise (preferably avoid) disturbances to rocky habitats, these areas must be managed as no-go areas. — Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. — Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type. — A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. — Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair. — A Fire Management Plan needs to be compiled to restrict the impact of fire. This is especially concerning stochastic fire events such as discarding of lit cigarette butts and/or glowing embers from cooking fires. The fire management plan must ensure that natural fire regimes of the surrounding vegetation is not affected. — Poaching of plants must not be tolerated and made a punishable offence. — A Walk-through Survey must be undertaken to enable micro-siting of infrastructure so that it does not overlap SCC. — Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas. — Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of								

Potential Impact: DESTRUCTION, FURTHER LOSS AND FRAGMENTATION OF HABITATS, ECOSYSTEMS & VEGETATION COMMUNITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
	relocating species to this area in order to reduce the probability of loss from the main project area.							

LOSS OF FLORA SPECIES OF CONSERVATION CONCERN (SCC)

The vegetation clearance for infrastructure will physically remove vegetation and in areas occupied by flora SCC, will ultimately lead to a loss in the population of these species. In addition, clearing of vegetation will result in exacerbated erosion of working areas This will result in the destruction and fragmentation of habitats, thereby affecting potential SCC The significance of the impact is shown in **Table 7-29**.

Table 7-29: Assessment of significance of potential impacts on flora species of conservation concern associated with the construction phase of the proposed development.

Potential Impact: INTRODUCTION OF ALIEN SPECIES, ESPECIALLY PLANTS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	5	5	4	**68**	**High**	(-)	High
With Mitigation	1	1	1	1	2	**6**	**Very Low**	(-)	High
Mitigation and Management Measures	— Areas with threatened flora species should be avoided. — The areas to be developed must be specifically demarcated to prevent movement into surrounding environments. — Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. — Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type. — A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. — Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair. — A Fire Management Plan needs to be compiled to restrict the impact of fire. This is especially concerning stochastic fire events such as discarding of lit cigarette butts and/or glowing embers from cooking fires. The fire management plan must ensure that natural fire regimes of the surrounding vegetation is not affected. — Poaching of plants must not be tolerated and made a punishable offence.							

	— A Walk-through Survey must be undertaken to enable micro-siting of infrastructure so that it does not overlap SCC. — Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas.

DIRECT MORTALITY OF FAUNA INCLUDING SPECIES OF CONSERVATION CONCERN (SCC) DUE TO ROADKILL, BLASTING AND EARTHWORKS

Direct mortalities may arise from earth moving blasting to install wind turbine bases is also a cause for concern. This impact is particularly pertinent to species that are secretive and tend to inhabit microhabitats such as rock crevices. These tend to be smaller species with limited dispersal ability. The unregulated movement of local people will also increase the likelihood of poaching of fauna in what was previously secluded habitat. The increased traffic due to construction vehicles and the transportation of staff/materials is also a risk, especially along the major roads within surrounding landscape. The significance of the direct mortality impact is shown in **Table 7-30**.

Table 7-30: Assessment of significance of direct mortality of fauna including Species of Conservation Concern due to roadkill, blasting and earthworks associated with the construction phase of the proposed development

Potential Impact: DESTRUCTION OF THREATENED PLANT SPECIES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	5	3	4	**60**	**Moderate**	(-)	High
With Mitigation	1	2	1	3	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures	— Several Search and Rescue operations must occur in the proposed infrastructure footprint to ensure that species are relocated to proximal natural areas. — Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area. — Minimise (preferably avoid) disturbances to rocky habitats, these areas must be managed as no-go areas. — The developer must fund or partially-fund and enable research into the biology and ecology of *Chersobius boulengeri* within their project areas. The research must include pre-construction, construction and operational phase spatial ecology and behaviour. Long-term survivability must also be considered. — The Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines). The mitigation measures recommended by Animalia (2016) are applicable. — Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals. — No trapping, killing, or poisoning of any wildlife is to be allowed — Signs must be put up to enforce this and must be made a punishable offence. — The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna. — Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be								

	avoided, and sodium vapor (yellow) lights should be used wherever possible. — Anti-perching devices must be installed on overhead powerlines to prevent increasing density of Pied Crows.

ENCROACHMENT OF DISTURBED AREAS BY INVASIVE ALIEN PLANTS (IAPS)

Clearance of vegetation and movement between areas will increase the potential for the establishment of invasive vegetation. The proposed vegetation clearance for the infrastructure will physically remove indigenous vegetation and potentially create an environment where invasive species can be introduced. The "edge effect" caused by these disturbances will likely result in IAP encroachment. The significance of the invasive species impact is shown in **Table 7-31**.

Table 7-31: Assessment of significance of Invasive Alien Plant (IAP) encroachment associated with the construction phase of the proposed development.

Potential Impact: DISPLACEMENT AND FRAGMENTATION OF THE FAUNAL COMMUNITY DUE TO HABITAT LOSS, DIRECT MORTALITIES & DISTURBANCE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	3	4	**52**	**Moderate**	(-)	High
With Mitigation	3	2	2	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures	— An Invasive Alien Plant Management Programme must be developed and implemented. — Erosion Control Programme must be developed and implemented. — All denuded areas to be rehabilitated using local indigenous species. — A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the presence of indigenous fauna.								

DEGRADATION OF SURROUNDING HABITATS DUE TO DUST POLLUTION

Construction activity and improperly managed stockpiles of construction material will lead to dust pollution and degradation of surrounding natural habitat. Due to the prevalent windy conditions of the area, this impact will be difficult to mitigate against this. Wetting of road surfaces may aid in control but the wind and dry season conditions will likely lead to rapid evaporation and therefore, not entirely suitable. The significance of the dust pollution impact is shown in **Table 7-32.**

Table 7-32: Assessment of significance of dust pollution associated with the construction phase of the proposed development

Potential Impact: DUST POLLUTION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	1	3	4	**44**	**Moderate**	(-)	High
With Mitigation	1	2	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— Dust control measures to be implemented such as wetting of road surfaces and properly managed stockpiles.								

DEGRADATION OF SURROUNDING HABITATS DUE TO POOR WASTE MANAGEMENT

Construction generates a large quantity of waste material and will lead to degradation of surrounding natural habitat if not properly managed. The significance of the waste impact is shown in **Table 7-33.**

Table 7-33: Assessment of significance of improper waste management associated with the construction phase of the proposed development

Potential Impact: IMPROPER WASTE MANAGEMENT	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	5	5	4	**72**	**High**	(-)	High
With Mitigation	1	2	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— Development and implementation of a Waste Management Plan.								

BEHAVIOURAL CHANGES AND EMIGRATION OF THE FAUNA COMMUNITY DUE TO DISTURBANCE FROM NOISE AND VIBRATION POLLUTION

The construction-related activity will lead to sound and vibration pollution as well as creating increased presence of people. These impacts will lead to stress, behavioural changes and emigration causing a negative shift in the fauna community wellbeing. The sound and vibration pollution are difficult to mitigate against. The significance of the disturbance impact is shown in **Table 7-34**.

Table 7-34: Assessment of significance of disturbance associated with the construction phase of the proposed development

Potential Impact: DISPLACEMENT AND FRAGMENTATION OF THE FAUNAL COMMUNITY DUE TO HABITAT LOSS, DIRECT MORTALITIES & DISTURBANCE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	3	4	**52**	**Moderate**	(-)	High
With Mitigation	4	2	2	3	4	**44**	**Moderate**	(-)	High
Mitigation and Management Measures	— Night time construction related activities must be avoided as far as possible to limit impacts to amphibians. — Unauthorised staff and contractors are not allowed to go beyond their specific demarcated working areas.								

7.6.2 OPERATIONAL PHASE

The following potential impacts were considered on biodiversity (fauna and flora) during the operational phase. This phase refers to when construction has been completed and the proposed infrastructure has been built and is functional.

CONTINUED ENCROACHMENT OF DISTURBED AREAS BY INVASIVE ALIEN PLANTS (IAPS)

Areas disturbed during construction will create niches and opportunity for encroachment by IAPs. Due to the vegetation communities that were cleared within infrastructure footprint during the construction phase being entirely transformed, impacts to the surrounding vegetation communities are considered. This will especially be along the edges of the access roads and around the wind turbine base. The significance of the IAP encroachment impact is shown in **Table 7-35**.

Table 7-35: Assessment of significance of Invasive Alien Plant encroachment associated with the operational phase of the proposed development

Potential Impact: CONTINUED DISTURBANCE OF VEGETATION COMMUNITIES, ESPECIALLY THREATENED SPECIES, AND ENCROACHMENT BY ALIEN INVASIVE PLANT SPECIES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	5	4	**60**	**Moderate**	(-)	High
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures	— Development and implementation of an Invasive Alien Plant Management Programme.								

CONTINUED EROSION OF SURROUNDING HABITAT DUE TO POOR STORMWATER MANAGEMENT

Due to the increase in stormwater generation from impenetrable surfaces or cleared areas, erosion of surrounding natural vegetation is a possible risk. The significance of the erosion impact is shown in **Table 7-36**.

Table 7-36: Assessment of significance of erosion associated with the operational phase of the proposed development.

Potential Impact: EROSION DUE TO POOR STOMRWATER MANAGEMENT	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	**5**	**3**	**3**	**5**	**4**	**64**	**High**	**(-)**	**High**
With Mitigation	**2**	**1**	**3**	**5**	**1**	**11**	**Very Low**	**(-)**	**High**
Mitigation and Management Measures	— Development and implementation of an Erosion Management Programme								

CONTINUED BEHAVIOURAL CHANGES AND EMIGRATION OF THE FAUNA COMMUNITY DUE TO DISTURBANCE FROM NOISE AND VIBRATION POLLUTION

Although noise and vibration pollution are typically associated with the construction of WEFs, these facilities do also cause noise and vibration pollution during operation from turbine machinery and blade movement (Lovich & Ennen, 2013). The noise pollution associated with operation of a WEF was demonstrated to influence the behaviour of a burrowing mammal species. It is hypothesised that the effects of vibrations on fauna may be similar to those associated with noise but requires further research. More research is required on the subject of operational phase noise and vibration impacts to ascertain which faunal groups are impacted, as well as the intensity and extent of the impact. Testudinidae are typical arid to semi-arid fauna components, including two SCC that are known to occur within the PAOI and surrounding landscape (see Section 6.1.8). Studies on the Agassiz's Desert Tortoise (*Gopherus agassizii*) within the United States has suggested that there is no significant influence of WEF operation to the species ecology (Agha *et al*, 2015; Jurlin *et al*, 2014). However, this needs to be researched within a South African context. The significance of this impact is shown in **Table 7-37.**

Table 7-37: Assessment of significance of noise and vibration pollution associated with the operational phase of the proposed development

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence

ONGOING DISPLACEMENT, DIRECT MORTALITIES AND DISTURBANCE OF FAUNAL COMMUNITY DUE TO HABITAT LOSS AND DISTURBANCES									
Without Mitigation	3	3	5	4	5	**75**	**High**	(-)	Low
With Mitigation	3	3	5	4	4	**60**	**Moderate**	(-)	Low
Mitigation and Management Measures	— Difficult to mitigate and further research is required to ascertain mitigation techniques — Management measures must be amended/implemented as new information becomes available. — Compile and implement a specific management plan for the life of the project, to be initiated during the pre-construction phase.								

INCREASE IN PIED CROW (*CORVUS ALBUS*) DENSITY DUE TO INCREASE IN ANTHROPOGENIC DEVELOPMENTS LEADING TO EXCESSIVE PREDATION OF TESTUDINIDAE

As aforementioned, there has been a substantial increase in the Pied Crow (*Corvus albus*) density in arid to semi-arid regions due to the prevalence of anthropogenic structures, especially road networks and overhead powerlines that act as corridors and nesting sites respectively, as well as the increase in roadkill (Joseph *et al*, 2017). As aforementioned, the increase in Pied Crow density within these areas has resulted in the increase in predation of Testudinidae, including SCC. Therefore, an increase in anthropogenic structures is likely to further increase the density of Pied Crows within the PAOI, thereby leading to elevated levels of predation on these SCC. The significance of this impact is shown in **Table 7-38**.

Table 7-38: Assessment of significance of increase in Pied Crow (Corvus albus) density on the Testudinidae fauna associated with the operational phase of the proposed development

Potential Impact: INCREASE IN PIED CROW (CORVUS ALBUS) DENSITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	3	5	5	4	**72**	**High**	(-)	High
With Mitigation	2	3	3	5	2	**26**	**Low**	(-)	High
Mitigation and Management Measures	— Installation of anti-perching devices as illustrated below may impede the increase in density of Pied Crows due to increase in anthropogenic structures. 								

7.6.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.7 BATS

The preliminary results from the first two of six additional months of pre-construction bat monitoring for the proposed Esizayo WEF have revealed that although there has been no change in onsite bat diversity, and no major change in the patterns of night-time bat activity in summer, the recently recorded levels of onsite bat activity are above average for the area. During the recent 2021/2022 summer period, at the same location, almost 30 times and six times more bat activity was recorded in rotor sweep and near ground level, than during 2015/2016. The higher recorded bat activity could be related to good rain in the region this past summer, and/or due to greater sensitivity of the current monitoring equipment, compared to that used in 2015/2016.

Going forward, among other things, the Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines) - based on the reasonable assumption (and growing evidence in South Africa; IWS unpubl. data) that there is a positive relationship between bat activity and bat fatalities at WEFs. Since bat activity may vary dramatically at a given location between years, adaptive management of bat fatalities (including potential sudden mass mortality events) is crucial during WEF operation.

7.7.1 CONSTRUCTION PHASE

DESTRUCTION OF BAT ROOSTS DUETO EARTHWORKS AND BLASTING

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Earthworks and blasting close to bat roosts will negatively affect bat populations through high mortality, which in effect will cause a decrease in bat population numbers. Direct impact. The significance of the impact is provided in **Table 7-39**.

Table 7-39: Construction Phase impact on destruction of bat roosts due to earthworks and blasting with the construction phase of the proposed development

Potential Impacts:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	3	2	3	**36**	**Moderate**	(-)	Medium
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)	Medium
Mitigation and Management Measures	— Adhere to the sensitivity map during turbine placement. — Blasting should be minimised and used only when necessary. If blasting of a rocky area with crevices and cracks is necessary, a Bat Specialist must be consulted before blasting in order to determine whether a bat roost is present in the rocky area. The mitigation measures will reduce the impact blasting and earthworks will have on the environmental parameter, through avoiding sensitive areas — The Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines).								

LOSS OF FORAGING HABITAT

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Some minimal foraging habitat will be permanently lost by construction of turbines and access roads. Temporary

foraging habitat loss will occur during construction due to storage areas and movement of heavy vehicles. The significance of the impact is provided in **Table 7-40**.

Table 7-40: Construction Phase impact on the loss of bat foraging habitat with the construction phase of the proposed development

Potential Impacts:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	5	3	4	60	Moderate	(-)	Medium
With Mitigation	3	2	3	3	2	22	Low	(-)	Medium
Mitigation and Management Measures	— Adhere to the sensitivity map. — Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. — Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist. — The mitigation measures will reduce the degree of habitat loss — The Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines).								

7.7.2 OPERATIONAL PHASE

BAT MORTALITIES DUE TO DIRECT BLADE IMPACT OR BAROTRAUMA DURING FORAGING ACTIVITIES (NOT MIGRATION)

The impact assessment completed by Animalia (2016) was considered in support of this impact assessment. Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration). If the impact is too severe (e.g. in the case of no mitigation) local bat populations may not recover from mortalities. The significance of the impact is provided in **Table 7-41**.

Table 7-41: Operational Phase impact on bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration) with the operational phase of the proposed development

Potential Impacts:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	2	5	4	5	80	High	(-)	Medium
With Mitigation	4	2	3	4	3	39	Moderate	(-)	Medium
Mitigation and Management Measures	— Adhere to the sensitivity map. — Apply mitigation measures (Animalia, 2016) outlined by the Bat Specialist during the operational bat monitoring study								

7.7.3 MITIGATION MEASURES

The mitigation schedule outlined in **Table 7-42** is based on the passive data collected in 2016. The data infers that mitigation be applied during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing simultaneously (considering conditions in which 80% of bat activity occurred). The mitigation measures are also considered applicable for the Esizayo WEF Expansion.

Table 7-42: The Wind Turbine Mitigation Schedule for Esizayo WEF and Expansion

TERMS OF MITIGATION IMPLEMENTATION

Peak activity (times to implement curtailment/ mitigation)	22 October - 2 February From the time of sunset to 04:40
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 5.5m/s (measured at 38m above ground level) and simultaneously Temperature above 13°C
Peak activity (times to implement curtailment/ mitigation)	15 March – 4 April From the time of sunset to 05:20
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 6m/s (measured at 38m above ground level) and simultaneously Temperature above 12°C
Peak activity (times to implement curtailment/ mitigation)	25 August – 20 October From the time of sunset to 04:40
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 6.0m/s (measured at 38m above ground level) and simultaneously Temperature above 10°C

Mitigation options include curtailment, blade feathering, blade lock, acoustic deterrents or light lures. The following terminology applies:

- **Curtailment:** Curtailment is defined as the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades.
- **Cut-in speed**: The cut-in speed is the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial RPMs below cut-in speed when no electricity is being produced.
- **Feathering or Feathered**: Adjusting the angle of the rotor blade parallel to the wind, or turning the whole unit out of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times.
- **Free-wheeling**: Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be "locked" and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel.
- **Increasing cut-in speed**: The turbine's computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer's set speed, and turbines are programmed to be feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back "into the

wind" and begin to spin normally and produce power. Blade locking or feathering that renders blades motionless below the manufacturers cut in speed, and don't allow free rotation without the gearbox engaged, is more desirable for the conservation of bats than allowing free rotation below the manufacturer's cut in speed. This is because bats can still collide with rotating blades even when no electricity is being produced.

- **Acoustic deterrents**: Are a developing technology and will need further investigation closer to the time of the wind farm operation, opportunities to test such devices may be available during operation of the facility.
- **Light lures**: Refers to the concept where strong lights are placed on the periphery (or only a few sides) of the wind farm to lure insects and therefore bats away from the turbines. However, the long term effects on bat populations and local ecology of this method is unknown.
- **Habitat modification**: With the aim of augmenting bat habitat around the wind farm in an effort to lure bats away from turbines, is not recommended. Such a method can be adversely intrusive on other fauna and flora and the ecology of the areas being modified. Additionally, it is unknown whether such a method may actually increase the bat numbers of the broader area, causing them to move into the wind farm site due to resource pressure.

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

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

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

All turbines of the Esizayo WEF must be curtailed below cut in speed and not allow for free-wheeling from the start of operation (Level 3 mitigation), for every night of the year from sunset to sunrise. However, actual impacts on bats will be monitored during the operational phase monitoring, and the recommended mitigation measures and levels of curtailment will be adjusted according to the results of the operational monitoring. This is an adaptive management approach, and it is crucial that any suggested changes to the initial proposed mitigation schedule be implemented within a maximum of 2 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).

7.7.4 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to those assessed for the construction phase.

7.8 AVIFAUNA

7.8.1 CONSTRUCTION PHASE

The following potential impacts have been identified:

- Displacement of priority species due to disturbance linked to construction activities in the construction phase; and
- Displacement due to habitat transformation in the construction phase.

DISPLACEMENT OF PRIORITY SPECIES DUE TO DISTURBANCE ASSOCIATED WITH THE CONSTRUCTION

The **Displacement due to disturbance associated with the construction of the wind turbines and associated infrastructure** is shown in **Table 7-43**.

Table 7-43: Displacement due to disturbance associated with the construction impact on Avifauna

Potential Impacts: DISPLACEMENT OF PRIORITY SPECIES DUE TO DISTURBANCE ASSOCIATED WITH THE CONSTRUCTION OF THE WIND TURBINES AND ASSOCIATED INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	**4**	**2**	**3**	**2**	**4**	**44**	**Moderate**	**(-)**	**High**
With Mitigation	3	2	2	2	3	27	**Low**	(-)	High
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. — Vegetation clearing to be kept at a bare minimum as required. — Excavated rocks should be removed, or all infilling for road construction should be compacted and all lose rock piles at the base or periphery of such infilling should be covered and packed down to eliminate all potential crevices and shelter for small mammals such as Rock Hyraxes (the primary source of food for the Verreaux's Eagles).								

DISPLACEMENT DUE TO HABITAT TRANSFORMATION ASSOCIATED WITH THE CONSTRUCTION

The **Displacement due to habitat transformation associated with the construction of the wind turbines and associated infrastructure** impact on avifauna is shown in **Table 7-44** below.

Table 7-44: Displacement due to habitat transformation associated with the construction impact on Avifauna

Potential Impacts: DISPLACEMENT DUE TO HABITAT TRANSFORMATION ASSOCIATED WITH THE CONSTRUCTION OF THE WIND TURBINES AND ASSOCIATED INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	**3**	**2**	**4**	**4**	**3**	**39**	**Moderate**	**(-)**	**High**
With Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)	High
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify Red List species that may be breeding within the project footprint to								

Potential Impacts: DISPLACEMENT DUE TO HABITAT TRANSFORMATION ASSOCIATED WITH THE CONSTRUCTION OF THE WIND TURBINES AND ASSOCIATED INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
	ensure that the impacts to breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. — Vegetation clearing to be kept at a bare minimum as required. — Excavated rocks should be removed, or all infilling for road construction should be compacted and all lose rock piles at the base or periphery of such infilling should be covered and packed down to eliminate all potential crevices and shelter for small mammals such as Rock Hyraxes (the primary source of food for the Verreaux's Eagles).							

7.8.2 OPERATIONAL PHASE

The following potential impacts have been identified;

— Collision mortality caused by the wind turbines in the operational phase;
— Electrocution on the 33kV MV overhead lines in the operational phase; and
— Collisions with the 33kV MV overhead lines in the operational phase.

MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE WIND TURBINES

The **Mortality of priority species due to collisions with the wind turbines** operational impact on avifauna is shown in **Table 7-45**.

Table 7-45: Mortality of priority species due to collisions with the wind turbines Operation Impact on Avifauna

Potential Impacts: MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE WIND TURBINES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	4	4	4	**60**	**Moderate**	**(-)**	**High**
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	High
Mitigation and Management Measures	— The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas. — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and								

Potential Impacts: MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE WIND TURBINES	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
	carcass searches to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that. — No turbines to be located in the buffer zones around major drainage lines, waterpoints and dams. — If an industry approved standard had been developed, one turbine blade must be painted black to reduce the risk of avian collisions. — If estimated annual collision rates indicate unacceptable mortality levels of priority species, i.e., if it exceeds the mortality threshold determined by the avifaunal specialist after consultation with other avifaunal specialists and BirdLife South Africa, additional measures will have to be implemented which could include shut down on demand (or other proven measures).							

MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE 33KV OVERHEAD POWER LINES

The **Mortality of priority species due to collisions with the 33kV overhead power lines** operational impact on avifauna is shown in **Table 7-46** below.

Table 7-46: Mortality of priority species due to collisions Operation Impact on Avifauna

Potential Impacts: MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE 33KV OVERHEAD POWER LINES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	3	4	4	4	**56**	**Moderate**	**(-)**	**High**
With Mitigation	3	3	3	4	3	**39**	**Moderate**	(-)	High
Mitigation and Management Measures	— The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas. — The 33kV medium voltage cable should be buried as far as possible. Overhead lines should only be considered if technical constraints to trenching are present. — A bird-friendly pole design must be employed for all 33kV overhead lines. The avifaunal specialist must approve the final design. — Bird flight diverters should be installed on all overhead 33kV power lines (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung. — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and carcass searches to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that.								

Potential Impacts: **MORTALITY OF PRIORITY SPECIES DUE TO COLLISIONS WITH THE 33KV OVERHEAD POWER LINES**	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
	— If estimated annual collision rates indicate unacceptable mortality levels of priority species, i.e., if it exceeds the mortality threshold determined by the avifaunal specialist after consultation with other avifaunal specialists and BirdLife South Africa, additional measures will have to be implemented which could include shut down on demand (or other proven measures).							

ELECTROCUTION OF PRIORITY SPECIES ON THE 33 KV INFRASTRUCTURE

The **Electrocution of priority species on the 33n kV infrastructure** operational impact on avifauna is shown in **Table 7-47** below.

Table 7-47: Electrocution of priority species on the on-site substation infrastructure Operation Impact on Avifauna

Potential Impacts: **ELECTROCUTION OF PRIORITY SPECIES ON THE ON-SITE SUBSTATION INFRASTRUCTURE**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	4	4	4	**60**	**Moderate**	**(-)**	**High**
With Mitigation	1	3	2	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	— The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas. — The 33kV medium voltage cable should be buried as far as possible. Overhead lines should only be considered if technical constraints to trenching are present. — A bird-friendly pole design must be employed for all 33kV overhead lines. The avifaunal specialist must approve the final design. — Bird flight diverters should be installed on all overhead 33kV power lines (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung. — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and carcass searches to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that.								

7.8.3 DECOMMISSIONING PHASE

The following potential impacts have been identified:

— Displacement of priority species due to disturbance linked to dismantling activities in the decommissioning phase.

DISPLACEMENT OF PRIORITY SPECIES DUE TO DISTURBANCE ASSOCIATED WITH THE DISMANTLING OF THE WIND TURBINES AND ASSOCIATED INFRASTRUCTURE

The **Displacement of priority species due to disturbance associated with the dismantling of the wind turbines and associated infrastructure** decommissioning impact on avifauna is shown in **Table 7-48** below.

Table 7-48: Displacement of priority species due to disturbance associated with the dismantling of the wind turbines and associated infrastructure Decommissioning Impact on Avifauna

Potential Impacts: DISPLACEMENT OF PRIORITY SPECIES DUE TO DISTURBANCE ASSOCIATED WITH THE DISMANTLING OF THE WIND TURBINES AND ASSOCIATED INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	2	4	**44**	**Moderate**	**(-)**	**High**
With Mitigation	3	2	2	2	3	**27**	**Low**	(-)	High
Mitigation and Management Measures	— Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.								

7.9 VISUAL

7.9.1 CONSTRUCTION PHASE

POTENTIAL VISUAL IMPACT OF CONSTRUCTION ACTIVITIES ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED WEF AND ANCILLARY INFRASTRUCTURE

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

The construction impact on the visual landscape is indicated in **Table 7-49** below.

Table 7-49: Construction Impact on Visual Landscape

Potential Impact: VISUAL IMPACT OF CONSTRUCTION ACTIVITIES ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED WEF INFRASTRUCTURE	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	4	4	3	2	3	**39**	**Moderate**	(-)	High
With Mitigation	3	3	3	2	3	**36**	**Moderate**	(-)	High
Mitigation and Management Measures	Planning:								

	— Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude. Construction: — Ensure that vegetation is not unnecessarily removed during the construction phase. — Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) wherever possible. — Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads. — Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities. — Reduce and control construction dust using approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent). — Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. — Rehabilitate all disturbed areas immediately after the completion of construction works.

7.9.2 OPERATIONAL PHASE

POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS LOCATED WITHIN A 5KM RADIUS OF THE WIND TURBINE STRUCTURES

The operation of the Esizayo WEF Expansion Project is expected to have a high visual impact (significance rating = 64) on observers/visitors residing at homesteads within a 5km radius of the wind turbine structures. This includes Smithkraal. The following WEF properties are provisionally included, due to their assumed support for WEF developments. The homestead's names are listed below.

— Leeufontein
— Die Bron
— Aurora
— Aanstoot

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operational impact on the visual landscape is indicated in **Table 7-50**.

Table 7-50: Operational Impact on Visual Landscape (within 0.5km)

Potential Impact: VISUAL IMPACT ON OBSERVERS (RESIDENTS AT HOMESTEADS AND VISITORS/TOURISTS) IN CLOSE PROXIMITY (I.E. WITHIN 5KM) TO THE WIND TURBINE STRUCTURES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	4	3	4	4	64	High	(-)	High
With Mitigation	5	4	3	4	4	64	High	(-)	High
Mitigation and Management Measures	Planning:								

	— Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole. Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS (OBSERVERS TRAVELLING ALONG ROADS) LOCATED WITHIN A 5 KM RADIUS OF THE WIND TURBINE STRUCTURES

The operation of the Esizayo WEF Expansion Project is expected to have a high visual impact (significance rating = 64) on observers traveling along the roads within a 5km radius of the wind turbine structures. This includes observers travelling along the:

— Observers travelling along the R354 arterial road and the Komsberg to Kareedoringkraal secondary road

No mitigation of this impact is possible (i.e., the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operational impact on the visual landscape is indicated in **Table 7-51**.

Table 7-51: Operational Impact on Visual Landscape (within 5 km)

Potential Impact: VISUAL IMPACT ON OBSERVERS TRAVELLING ALONG THE ROADS IN CLOSE PROXIMITY (I.E. WITHIN 5KM) TO THE WIND TURBINE STRUCTURES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	4	3	4	4	**64**	**High**	(-)	High
With Mitigation	5	4	3	4	4	**64**	**High**	(-)	High
Mitigation and Management Measures	Planning: — Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole — Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN THE REGION (5 – 10 KM RADIUS)

The Esizayo WEF Expansion Project could have a moderate visual impact (significance rating = 56) on residents of (or visitors to) homesteads within a 5 - 10km radius of the wind turbine structures.

Residents of/visitors to:

— Josephskraal
— Leeukrans

— Klipgat

The following properties are provisionally included, due to their location on farms earmarked for various WEF developments and their assumed support for WEF developments within the region:

— Saaiplaas
— Avondsrus
— Nuwerus
— Fortuin
— Ou Mure
— Bon Esperance
— Swartland

No mitigation of this impact is possible (i.e., the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operational impact on the visual landscape is indicated in **Table 7-52**.

Table 7-52: Operational Impact on Visual Landscape (5 – 10km)

Potential Impact: VISUAL IMPACT ON OBSERVERS TRAVELLING ALONG THE ROADS AND RESIDENTS AT HOMESTEADS WITHIN A 5 – 10KM RADIUS OF THE WIND TURBINE STRUCTURES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	3	3	4	4	**56**	**Moderate**	(-)	High
With Mitigation	4	3	3	4	4	**56**	**Moderate**	(-)	High
Mitigation and Management Measures	Planning: — Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole — Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN THE REGION (10 – 20 KM RADIUS)

The Expansion Project could have a moderate visual impact (significance rating = 48) on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures.

Residents of/visitors to:

— Kakkelaksfontein
— Schelmhoek
— Zoutkloof
— Jakkelsfontein

The following property (located within the Hidden valley WEF) is provisionally included, due to its assumed support for WEF developments. The homestead's name is listed below:

— De Hoop

No mitigation of this impact is possible (i.e., the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operational impact on the visual landscape is indicated in **Table 7-53**.

Table 7-53: Operational Impact on Visual Landscape (10 – 20 km)

Potential Impact: VISUAL IMPACT ON OBSERVERS TRAVELLING ALONG THE ROADS AND RESIDENTS AT HOMESTEADS WITHIN A 10 – 20KM RADIUS OF THE WIND TURBINE STRUCTURES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	3	4	4	**48**	**Moderate**	(-)	High
With Mitigation	3	2	3	4	4	**48**	**Moderate**	(-)	High
Mitigation and Management Measures	Planning: — Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

POTENTIAL IMPACT ON SHADOW FLICKER

Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e., when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "most shadow impact is associated with 3-4 times the height of the object". Based on this research, a 1,000m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring.

There are no places of residence within the 1,000m buffer. The significance of shadow flicker is therefore anticipated to be low to negligible.

The operational impact on shadow flicker is indicated in **Table 7-54**.

Table 7-54: Operational Impact on Shadow Flicker

Potential Impact: VISUAL IMPACT OF SHADOW FLICKER ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	4	3	4	2	**26**	**Low**	(-)	High
With Mitigation	2	4	3	4	4	**26**	**Low**	(-)	High
Mitigation and Management Measures	— N.A. due to the low probability of occurrence								

POTENTIAL VISUAL IMPACT OF LIGHTING AT NIGHT ON VISUAL RECEPTORS IN CLOSE TO MEDIUM PROXIMITY (< 5KM AND POTENTIALLY UP TO 10KM) TO THE PROPOSED WEF

The area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity.

Sky glow is a potential lighting impact. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contributes to the increase in sky glow.

The operational impact on shadow flicker is indicated in **Table 7-55**.

Table 7-55: Operational Impact on lighting at night on visual receptors in close to medium proximity

Potential Impact: VISUAL IMPACT OF LIGHTING AT NIGHT ON SENSITIVE VISUAL RECEPTORS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	5	4	3	4	4	**64**	**High**	(-)	High
With Mitigation	3	4	3	4	3	**42**	**Moderate**	(-)	High
Mitigation and Management Measures	— Implement needs-based night lighting if considered acceptable by the CAA. — Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. — Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). — Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. — Make use of minimum lumen or wattage in fixtures. — Make use of down-lighters, or shielded fixtures. — Make use of Low Pressure Sodium lighting or other types of low impact lighting. — Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.								

POTENTIAL VISUAL IMPACT OF THE ANCILLARY INFRASTRUCTURE

On-site ancillary infrastructure associated with the WEF includes a 33/132kV substation and collector substation, underground 33kV cabling between the wind turbines, internal access roads, workshop and office and staff accommodation. No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within (and be overshadowed by) that of the turbines.

The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

The operational impact of the visual impact on ancillary infrastructure is indicated in **Table 7-56**.

Table 7-56: Operational Impact of the ancillary infrastructure

Potential Impact: VISUAL IMPACT OF THE ANCILLARY INFRASTRUCTURE ON OBSERVERS IN	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence

CLOSE PROXIMITY TO THE STRUCTURES									
Without Mitigation	2	4	3	4	2	**26**	**Low**	(-)	High
With Mitigation	3	4	3	4	2	**36**	**Low**	(-)	High
Mitigation and Management Measures	Planning: — Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

POTENTIAL VISUAL IMPACT OF THE PROPOSED WEF INFRASTRUCTURE ON THE SENSE OF PLACE OF THE REGION.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality.

The significance of the visual impacts on the sense of place within the region (i.e., beyond a 20km radius of the development and within the greater region) is expected to be of low significance.

No mitigation of this impact is possible (i.e., the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

The operational impact on the sense of place is indicated in **Table 7-57**.

Table 7-57: Operational Impact on Sense of place

Potential Impact: THE POTENTIAL IMPACT ON THE SENSE OF PLACE OF THE REGION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	3	4	2	**20**	**Low**	(-)	High
With Mitigation	2	1	3	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	Planning: — Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: — Maintain the general appearance of the facility as a whole Decommissioning: — Remove infrastructure not required for the post-decommissioning use. — Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

7.9.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to the assessed for the construction phase.

7.10 WASTE MANAGEMENT

7.10.1 CONSTRUCTION PHASE

Construction-related waste is not anticipated to trigger the need for a Waste Management Licence (WML) in terms of NEMWA (Refer to **Section 2**). Waste management at the Project site will be undertaken in line with the EMPr to consider the correct disposal of general and hazardous waste generated on the Project. **Table 7-58** describes the different waste streams that the proposed Project will likely generate, as well as the various potential management options. Due to the nature of the Project, waste will mainly be generated during the construction phase. During operation, Eskom staff are only on the site for limited amount of time as and when maintenance is required.

The construction impact on improper waste management and littering is indicated in **Table 7-59**.

Table 7-58: Waste Management Options

WASTE	TYPE OF WASTE	MANAGEMENT OPTIONS
Hydrocarbons (Contaminated soil)	Hazardous	Fuel and oil spillages can be a source of contamination of water sources and the soil. Management options include: — Ensure hazardous waste is stored separately from general waste; — Using spill kits to clean any spillages; — Ensure storage facilities are maintained and meet industry regulations; — Transportation and storage of fuel must be regulated and correctly managed according to the EMPr; — Waste generated along servitude to be taken to the contractor laydown area at the end of each day; — Co-ordinate waste removal with the removal of waste from the contractor laydown area; and — All hazardous waste is to be disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).
Contaminated Personal Protective Equipment (PPE) / Used oil containers	Hazardous	PPE can be contaminated during handling of hydrocarbons. Management options include: — Store contaminated PPE / used oil containers in hazardous waste skips along the servitude; — Waste generated along servitude to be taken to the contractor laydown area at the end of each day; — Co-ordinate waste removal with the removal of waste from the contractor laydown area; and — Ensure contaminated PPE is disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).

WASTE	TYPE OF WASTE	MANAGEMENT OPTIONS
General waste	General	General waste (inorganic matter) can be disposed of as per normal and form part of the municipal waste management system. Management options include: — Ensure waste is stored securely in refuse bins; — Recycling of waste to be undertaken, where possible; — Waste generated along servitude to be taken to the contractor laydown area at the end of each day; and — Co-ordinate waste removal with the general removal of waste from the contractor laydown area.
Food waste	General	Food waste is generated as site personnel take their meals on the construction site. Management options include: — Store any waste and packaging into a labelled food waste bin; — Waste generated along servitude to be taken to the contractor laydown area at the end of each day; — Co-ordinate waste removal with the removal of waste from the contractor laydown area; and — Co-ordinate waste removal with the general removal of waste from the contractor laydown area.

Table 7-59: Construction Impact on Improper Waste Management

Potential Impact: IMPROPER WASTE MANAGEMENT AND LITTERING	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	1	3	1	4	**32**	**Moderate**	(-)	High
With Mitigation	2	1	1	1	3	**15**	**Very Low**	(-)	High
Mitigation and Management Measures	— Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be stored at the construction camp / laydown area and removed from site on a weekly basis to prevent rodents and pests entering the site; — A minimum of one toilet must be provided per 10 persons; — The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility; — Hazardous waste must be stored separately in covered containers and appropriately disposed of at a licensed disposal facility; — Recycling should take place, where possible; — Where a registered disposal facility is not available close to the Project area, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site; and — Storage of domestic waste shall be in covered waste skips.								

7.10.2 OPERATIONAL PHASE

No operational phase impacts are expected as a maintenance team will only be on site as and when required (intermittently) and for an extremely limited time. As such, the impacts are considered negligible.

7.10.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to the assessed for the construction phase.

7.11 TRAFFIC

The Operational and Decommissioning phases were not assessed, as the trip generation during these phases will be negligible, with a negligible impact.

7.11.1 CONSTRUCTION PHASE

NOISE, DUST & EXHAUST POLLUTION DUE TO VEHICLE TRIPS ON-SITE

The impact of additional traffic during construction is expected to be minimal and short term. Trucks delivering construction supplies will predominantly make use of the R354 and existing access roads. The intermittent movement of trucks delivering construction supplies is likely to have a low impact. The construction impact on traffic is indicated in **Table 7-60**.

Table 7-60: Construction Impact due to vehicle trips on-site

Potential Impact: VEHICLE ENGINE AND TYRE ON ROAD NOISE, DUST & EXHAUST FUMES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	1	1	5	**25**	**Low**	(-)	High
With Mitigation	1	1	1	1	2	**8**	**Very Low**	(-)	High
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that access the site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby reducing noise/pollution levels								

NOISE, DUST & EXHAUST POLLUTION DUE TO ADDITIONAL TRIPS ON THE ACCESS ROADS

The impact of additional traffic during construction is expected to be minimal and short term. Trucks delivering construction supplies will predominantly make use of the R354 and existing access roads. The intermittent movement of trucks delivering construction supplies is likely to have a low impact. The construction impact on traffic is indicated in **Table 7-61**.

Table 7-61: Construction Impact due to additional trips on the access roads

Potential Impact: VEHICLE ENGINE AND TYRE ON ROAD NOISE, DUST & EXHAUST FUMES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	1	1	5	**30**	**Low**	(-)	High
With Mitigation	1	1	1	1	2	**10**	**Very Low**	(-)	High
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel to site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby reducing noise/pollution levels								

NOISE, DUST & EXHAUST POLLUTION DUE TO ADDITIONAL TRIPS ON THE R354

The impact of additional traffic during construction is expected to be minimal and short term. Trucks delivering construction supplies will predominantly make use of the R354 and existing access roads. The intermittent movement of trucks delivering construction supplies is likely to have a low impact. The construction impact on traffic is indicated in **Table 7-62**.

Table 7-62: Construction Impact due to additional trips on the R354

Potential Impact: INCREASE IN VEHICLE ENGINE AND TYRE ON ROAD NOISE & EXHAUST FUMES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	1	3	1	1	5	**30**	**Low**	(-)	High
With Mitigation	1	1	1	1	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— All vehicles that travel to site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby reducing noise/pollution levels								

7.12 HERITAGE

7.12.1 CONSTRUCTION PHASE

ARCHAEOLOGY

Where project activities such as the construction of access roads, the creation of WTG laydown areas, the excavation of foundations for the WTGs and trenching for electrical cabling intersect with archaeological sites and material, impacts will occur.

However, the development Exclusion Area referred to the above covers the principal drainages on the proposed WEF expansion site where there is the greatest likelihood of archaeological sites and material occurring. This means that there will be no impacts on archaeological resources in the area of the development site which had the greatest (albeit low, based on the survey results) potential archaeological sensitivity.

Impacts to archaeological sites and materials on the higher ground where the WTGs are to be installed are unlikely given the proven paucity of archaeological material on the higher ground in the area.

Significant impacts on archaeological resources during the construction, operational and de-commissioning phases of the Esizayo WEF expansion project are thus not anticipated.

BUILT ENVIRONMENT

It is unlikely that there will be any direct impacts to the Leeuwenfontein and unnamed farm complexes. The former is located within the Exclusion Area and will thus be exempt from direct impacts.

Although the unnamed farm complex is outside the Exclusion Area it is located at the extreme eastern edge of the expansion area, and since access roads to service the expansion area will develop from those to be built for the authorised Esizayo WEF, there is unlikely to be any direct impact on this remote farmstead from the construction, operation or decommissioning of the WEF expansion.

Similarly, it is unlikely that WEF expansion-related activities will occur in proximity to either of the two shepherds' hut and associated kraals, despite both being located outside the Exclusion Area. No impacts to these features are anticipated.

Depending on the routing of the access roads, there is the potential for the Aanstoot farm complex to be impacted by the proposed expansion of the Esizayo WEF. Once the proposed alignment of the access roads for the WEF expansion are known the potential for impacts to the Aanstoot farmstead may need to be re-assessed.

GRAVES AND BURIALS

There are unlikely to be any impacts to the graveyard identified at the Leeuwenfontein farmstead because it lies within the project Exclusion Area.

Although considered unlikely, it is possible that currently unknown graves or burials may be affected by the expansion of the Esizayo WEF.

The impact assessment for the above mentioned impacts is outlined in **Table 7-63**.

Table 7-63: Construction Impact on Heritage

Potential Impact: DISTURBANCE, DAMAGE OR DISTRUCTION TO HERITAGE RESOURCES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	1	1	5	5	2	**24**	**Low**	(-)	High
With Mitigation	1	1	5	3	1	**10**	**Very Low**	(-)	High
Mitigation and Management Measures	— The Exclusion Area proposed by the developer must be implemented and no WEF-related activities may take place within the area. Should this not be the case, then the assessment of potential impacts on heritage resources in this report will need to be revisited and new measures to protect heritage resources or mitigate impacts to them will be required. — Once the layout of the access roads is available, they will need to be surveyed for heritage resources and the results incorporated into the Final BAR or the EMPr. — If any archaeological material or human burials are uncovered during the course of the construction of the WEF expansion, then work in the immediate area must be halted. The find must be reported to Heritage Western Cape and may require inspection and mitigation by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution								

7.12.2 OPERATIONAL PHASE

There are no anticipated heritage impacts during the operational phase, as any existing resources would have been discovered during excavations and other intrusive construction activities.

7.12.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to the assessed for the construction phase.

7.13 PALAEONTOLOGY

7.13.1 CONSTRUCTION PHASE

The construction phase of the proposed WEF expansion will entail extensive surface clearance (notably for internal roads, pylon footings) as well as excavations into the superficial sediment cover and also into the underlying bedrock (e.g. for wind turbine foundations). The development may therefore adversely affect potential fossil heritage within the study area by destroying, damaging, disturbing or permanently sealing-in fossils

preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

IMPACTS ON FOSSIL HERITAGE

Due to slow-acting natural weathering and erosion processes in a semi-arid Karoo setting, where rates of erosion usually exceed rates deposition, fossils already exposed at the ground surface are being gradually destroyed while new, previously buried fossils are being exposed and "prepared out". Farming activities within the project area have a minimal impact on local palaeontological heritage resources. Fossil collection by qualified palaeontologists or (illegal) amateurs is probably negligible, although this is known to occur elsewhere in the Sutherland region.

This assessment refers to impacts on fossil heritage preserved at or beneath the ground surface within the footprint of the WEF Expansion during the construction phase, mainly due to surface clearance and excavation activities. It is noted that surface clearance for lengthy internal roads associated with turbine positions and new powerlines is likely to have the greatest impact on fossil heritage. Such impacts on fossil heritage are limited to the site (development footprint) and are generally direct, negative and of permanent effect (irreversible). While fossils of some sort (including microfossils, invertebrate trace fossils and plant debris) are of widespread occurrence within the project area, unique or scientifically-important fossils are very scarce indeed here, even where bedrock exposure levels are locally high. It is concluded that impacts on palaeontological heritage resources of scientific and / or conservation value are of low probability and of low magnitude since (1) significant fossil sites are unlikely to be affected and (2) in many cases these impacts can be mitigated through the proposed Chance Fossil Finds Protocol (Appendix 2). The overall impact significance during the construction phase of the WEF Expansion infrastructure without mitigation is rated as LOW (NEGATIVE) in terms of palaeontological heritage resources. Should the proposed mitigation measures outlined in Section 6 below be fully implemented, the impact significance would remain LOW (NEGATIVE). However, residual negative impacts such as the inevitable loss of fossil heritage would be partially offset by an improved understanding of Karoo fossil heritage which is considered a positive impact.

The potential for any **fossil heritage** impacts is indicated in **Table 7-64** below.

Table 7-64: Construction Impact on Fossil Heritage

Potential Impact: **DISTURBANCE, DAMAGE OR DISTRUCTION TO HERITAGE RESOURCES**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	1	5	5	2	**26**	**Low**	(-)	High
With Mitigation	2	1	5	5	2	**26**	**Low**	(-)	High
Mitigation and Management Measures	— Monitoring of all surface clearance and substantial excavations (>1 m deep) by the ECO / ESO for fossil material (*e.g.* bones, teeth, fossil wood) on an on-going basis during the construction phase. — Safeguarding of chance fossil finds (preferably *in situ*) during the construction phase by the responsible ECO / ESO, followed by reporting of finds to Heritage Western Cape (HWC) for the Western Cape. — Recording and judicious sampling of significant chance fossil finds by a qualified palaeontologist, together with pertinent contextual data (stratigraphy, sedimentology, taphonomy). — Curation of fossil material within an approved repository (museum / university fossil collection) and submission of a Phase 2 palaeontological heritage report to HWC by a qualified palaeontologist.								

7.13.2 OPERATIONAL PHASE

There are no anticipated impacts on palaeontology during the operational phase as any existing resources would have been discovered during excavations and other intrusive construction activities.

7.13.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to the assessed for the construction phase.

7.14 SOCIO-ECONOMIC

7.14.1 CONSTRUCTION PHASE

CREATION OF LOCAL EMPLOYMENT, SKILLS DEVELOPMENT AND BUSINESS OPPORTUNITIES

The construction phase of the 200 MW WEF will extend over a period of approximately 18 months and create in the region of 350 employment opportunities. Based on information provided by the proponent, approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. The closest towns to the site are Matjiesfontein (25 km to the south), Laingsburg (~ 33 km to the east) and Touws River (~ 61 km to the north).

Members from the local communities in these towns will benefit from the low skilled and semi-skilled employment opportunities. Most of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from these local communities. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. However, based on the experience from existing REFs that have been established on the Komsberg REDZ, the employment opportunities for members from the local community have been limited. This has in part been due to the low education and skills levels in the area.

Therefore, in the absence of specific commitments from the developer to maximise local employment targets the potential opportunities for local employment are likely to be limited. Where feasible the implementation of a training and skills development programme prior to the commencement of construction would also increase the potential to employ local community members. The number of low skilled and semi-skilled positions taken up by members from the local community will depend on the effective implementation of these enhancement measures by the proponent in consultation with the LM. However, due to the small size of the local towns in the area the ability to find suitably qualified and educated local workers may however be limited.

Based on information from similar projects the total wage bill will be in the region of R 31 million (2022 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area. The capital expenditure associated with the construction phase will be approximately R 2 billion (2022 Rand value). Due the lack of diversification in the local economy the potential for local companies is likely to be limited. The majority of benefits are therefore likely to accrue to contractors and engineering companies based outside the LM. Implementing the enhancement measures listed below can create potential opportunities for potentially qualified local companies.

The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site.

The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

Based on similar projects the construction phase of for the grid connection will extend over a period of approximately 3-6 months and create in the region of 20-30 employment opportunities. Approximately 80% of the jobs will be low-skilled, 15% semi-skilled and 5% skilled. Most of the low and semi-skilled employment opportunities would benefit community members from local towns in the area, including Laingsburg, Matjiesfontein and Sutherland. A percentage of the high skilled positions may also benefit the local community.

Most of the employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from these local communities.

Given high local unemployment levels and limited job opportunities in the area, this will represent a localised, social benefit. The remainder of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the grid infrastructure. However, in the absence of specific commitments from the developer to maximise local employment targets the potential opportunities for local employment will be limited. The proponent should therefore commit to employing as many local community members as possible.

The total wage bill will be in the region of R 1 million (2021 Rand values). This is based on assumption of R 8 000 per month for low skilled workers, R 12 000 per month for semi-skilled workers and R 25 000 per month for high skilled workers over 4 months. A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in MM.

The capital expenditure associated with the construction of grid infrastructure will be ~ R 7 million and will create opportunities for local companies and the regional and local economy. Implementing the enhancement measures listed below can enhance these opportunities. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site. However, given the relatively small scale of the project and short duration of the construction phase these benefits will be limited.

The impact on **employment, skills development and business opportunities** is shown in **Table 7-65**.

Table 7-65: Construction Impact on Employment, Skills Development and Business Opportunities

Potential Impact: CREATION OF EMPLOYMENT AND BUSINESS OPPORTUNITIES DURING CONSTRUCTION	Magnitude	Extent	Reversibilit	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	-	2	3	**21**	**Low**	(+)	High
With Mitigation	3	3	-	2	4	**32**	**Moderate**	(+)	High
Mitigation and Management Measures	Employment — Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, 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 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 LM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase. — The local authorities, community representatives, and organisations on the interested and affected party database 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. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.								

	— The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. Business — The proponent should liaise with the LM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work. *Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.*

PRESENCE OF CONSTRUCTION WORKERS AND POTENTIAL IMPACTS ON FAMILY STRUCTURES AND SOCIAL NETWORKS

The presence of construction workers can pose a potential risk to family structures and social networks. 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, mainly of male construction workers, including:

— An increase in alcohol and drug use.
— An increase in crime levels.
— The loss of girlfriends/boyfriends and/or wives/husbands to construction workers.
— An increase in teenage and unplanned pregnancies.
— An increase in prostitution.
— An increase in communicable diseases, including COVID-19, tuberculosis (TB) and sexually transmitted diseases (STDs), including HIV.

The proponent has indicated that the objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. However, based on experience from current projects located in the Komsberg REDZ most of the employment opportunities have been taken up by contractors from outside of the area. Experience from current projects has indicated that the presence of construction workers has impacted on local communities in the area. These impacts include increase in STD rates and unplanned pregnancies. While it is possible to reduce the risks associated with construction workers it is not possible to totally avoid the potential impacts.

The impact of the **presence of construction workers on family structures and social networks** is show in **Table 7-66**.

Table 7-66: Construction Impact on Family Structures and Social Networks

Potential Impact: PRESENCE OF CONSTRUCTION WORKERS AND POTENTIAL IMPACTS ON FAMILY STRUCTURES AND SOCIAL NETWORKS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	3	2	3	**30**	**Low**	(-)	High
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	High

Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. — 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 option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. — The proponent and contractor should develop a Code of Conduct (CoC) for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The CoC should be signed by the proponent and the contractors before the contractors move onto site. The CoC should form part of the CHSSP. — The proponent and the contractor should implement an HIV/AIDS, COVID-19 and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP. — The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site. — The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end. — No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

INFLUX OF JOB SEEKERS

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed project on its own does not constitute a large construction project, the establishment of a number of renewable energy projects in the area may attract job seekers to the area. 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 in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include: An increase in alcohol and drug use.

— An increase in crime levels.
— Impacts on existing social networks and community structures.
— Competition for housing, specifically low-cost housing.
— Competition for scarce jobs.

— Increase in incidences of crime.

These issues are similar to the concerns associated with the presence of construction workers and are discussed in the section above. The findings of the SIA indicate that the potential for economically motivated in-migration and subsequent labour stranding is likely to be negligible. This is due to the relatively isolated location of the study area and the limited economic and employment opportunities in the nearby towns of Laingsburg and Sutherland. The risks associated with the influx of job seekers are therefore likely to be low. The impact of an **influx on job seekers** is show in **Table 7-67**.

Table 7-67: Construction Impact on influx of job seekers on local communities

Potential Impact: INFLUX OF JOB SEEKERS ON LOCAL COMMUNITY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)	High
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	High
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent, in consultation with the LM, should investigate the option of establishing a MC to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MC should also include the other proponents of solar energy projects in the area. — 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.								

RISK TO SAFETY, LIVESTOCK, AND FARM INFRASTRUCTURE

The presence on and movement of construction workers on and off the site poses 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. The presence of construction workers on the site also increases the exposure to local farming operations to the outside world, which, in turn, increases the potential risk of stock theft.

The majority of farmers in the area have been exposed to the construction of the Roggeveld, Karusa and Soetwater WEFs, and therefore have first-hand experience of the impacts associated with the construction of WEFs and the associated infrastructure, such as grid connections. The key issues raised included:

— Impact of construction related activities and movement of construction vehicles on the veld. Due to the sensitivity of the vegetation disturbances take many years to recover.
— Farm gates left open by contractors and Eskom employees. This was raised as key concern by all the affected landowners interviewed. This has resulted in stock losses and increased vulnerability to stock theft. Mixing of flocks of different breeds (e.g., meat and wool sheep) also impacts on farming operations. Time and resources are also spent on recovering stock that has escaped due to gates being left open.
— Damage to farm fences. The damage to farm fences poses the same risks to farming operations as leaving farm gates open. In many instances damage to fences caused by contractors occurs in remote areas and is not reported to the farmer.
— Lack of awareness amongst contractors of the impacts that their activities can have on farming operations.

The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction workers on the site during the construction phase. However, as indicated

by the comments from local farmers in the area, it would appear that these measures have not being effectively implemented during the construction of Roggeveld, Karusa and Soetwater WEFs. The mitigation measures to address these risks are outlined below.

The impact of the **risk to safety, livestock, and farm infrastructure** is shown in **Table 7-68**.

Table 7-68: Construction Impact on Safety, Livestock, and Farm Infrastructure

Potential Impact: RISK TO SAFETY, LIVESTOCK, AND DAMAGE TO FARM INFRASTRUCTURE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)	High
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)	High
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. — All farm gates must be closed after passing through. — Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. — The proponent should establish a MC and CoC for workers (see above). — The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). — The proponent should implement a Grievance Mechanism that provides local farmers with an effective and efficient mechanism to address issues related to report issues related to damage to farm infrastructure, stock theft and poaching etc. — The Environmental Management Plan (EMP) must 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 in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. — Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the								

	CoC. All dismissals must be in accordance with South African labour legislation. — It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

CONSTRUCTION RELATED ACTIVITIES

The construction activities on site and movement of heavy construction vehicles during the construction phase has the potential to create noise and dust impacts, damage local roads and create safety impacts for other road users. Based on the findings of the SIA the potential dust and noise impacts associated with the construction phase are likely to be limited. The traffic related impacts associated with the transport of materials to the site can also be effectively managed if the required mitigation are implemented. However, the construction of renewable energy facilities and the associated grid infrastructure has resulted in increased traffic and damage to local roads in the area. In addition to construction vehicles, the transport of workers to site and speed at which taxis travelled has been identified as concern.

The impact of **construction related activities** is shown in **Table 7-69**.

Table 7-69: Construction Impact on Noise, Dust and Safety

Potential Impact: **CONSTRUCTION ACTIVITIES**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	2	1	2	3	**21**	**Low**	(-)	High
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)	High
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should establish a MC to monitor the construction phase and the implementation of the recommended mitigation measures. The MC should be established before the construction phase commences, and should include key stakeholders, including representatives from local farmers and the contractor(s). The MF should also address issues associated with damage to roads and other construction related impacts. — Ongoing communication with landowners and road users during construction period. This should be outlined in the SEP. — The proponent should implement a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. — Implementation of a road maintenance programme throughout the construction phase to ensure that the affected roads maintained in a good condition and repaired once the construction phase is completed. — Repair of all affected road portions at the end of construction period where required. — Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers.								

	— All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

If damage to local roads is not repaired, then this will affect the other road users and result in higher maintenance costs. The costs will be borne by road users who were no responsible for the damage.

RISK OF VELD FIRES

The presence on and movement of construction workers on and off the site and construction related activities such as welding etc., increases the risk of veld fires which pose a risk to livestock, farm infrastructure and game. The loss of grazing also poses a threat to local livelihoods that are dependent on livestock farming. The risk of veld fires is higher during the dry, windy summer months of December through to March. The local landowners indicated that although the risk of veld fires was low, they do pose a threat to farming operations.

The impact **veld fires** is shown in **Table 7-70**.

Table 7-70: Construction Impact on Veld Fires

Potential Impact: **RISK POSED BY VELD FIRES**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	High
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)	High
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. — Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. — Smoking on site should be confined to designated areas. — Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. — Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle. — Contractor should provide fire-fighting training to selected construction staff. — No construction staff, with the exception of security staff, to be accommodated on site overnight. — As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms.								

	The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.

7.14.2 OPERATIONAL PHASE

IMPROVE ENERGY SECURITY AND DEVELOP THE RENEWABLE ENERGY SECTOR

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed WEF also reduces the carbon footprint associated with energy generation. The project should therefore be viewed 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.

South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. Load shedding in the first six months of 2015 was estimated to have cost South African businesses R13.72 billion in lost revenue with an additional R716 million was spent by businesses on backup generators. A survey of 3 984 small business owners found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period.

The operational impact on **energy security** is shown in **Table 7-71**.

Table 7-71: Operational Impact on Improved Energy Security

Potential Impact: DEVELOPMENT OF INFRASTRUCTURE TO IMPROVE ENERGY SECURITY AND SUPPORT RENEWABLE SECTOR	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	4	0	4	4	**48**	**Moderate**	(-)	High
With Mitigation	4	4	0	4	5	**60**	**High**	(+)	High
Mitigation and Management Measures	— Maximise the number of employment opportunities for local community members. — Implement training and skills development programs for members from the local community. — Maximise opportunities for local content and procurement.								

Residual impacts include overall reduction in CO_2 emission, reduction in water consumption for energy generation, contribution to the development of the renewable energy sector in South Africa and benefit for economic development and investment.

CREATION OF EMPLOYMENT, SKILLS DEVELOPMENT AND BUSINESS OPPORTUNITIES

The proposed development will create in the region of 20 full time employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled 25%, and 5% skilled 5%. Based on similar projects the annual operating budget will be in the region of R 24 million (2022 Rand values), including wages.

The impact on **employment opportunities** is shown in **Table 7-72**.

Table 7-72: Operational Impact on Employment Opportunities

Potential Impact: CREATION OF EMPLOYMENT OPPORTUNITIES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	0	4	2	**14**	**Very Low**	(+)	High

With Mitigation	3	2	0	4	4	**36**	**Moderate**	(+)	High
Mitigation and Management Measures	Employment — Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, 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 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 LM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase. — The local authorities, community representatives, and organisations on the interested and affected party database 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. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. — The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. Business — The proponent should liaise with the LM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.								

Residual impacts include the creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area.

GENERATE INCOME FOR AFFECTED LANDOWNERS

The proponent will be required to either purchase the land or enter into a rental agreement with the affected landowners for the use of the land for the establishment of the proposed WEF. Based on the findings of the SIA the area is prone to droughts and farming operations can be challenging. Any additional source of income therefore represents a significant benefit for the affected landowner(s). The additional income would assist to reduce the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. The additional income would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy.

The impact on **income generated for affected farmer(s)** is shown in **Table 7-73**.

Table 7-73: Operational Impact on income generated for affected farmer(s)

Potential Impact: INCOME GENERATED FOR AFFECTED FARMERS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	1	0	4	3	**21**	**Low**	(+)	High
With Mitigation	3	2	0	4	5	**45**	**Moderate**	(+)	High
Mitigation and Management Measures	— Implement agreements with affected landowners.								

SOCIO-ECONOMIC DEVELOPMENT CONTRIBUTIONS

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended 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.
- Support for SMME's.

The impact on **socio-economic development contributions** is shown in **Table 7-74**.

Table 7-74: Operational Impact on income generated for affected farmer(s)

Potential Impact: SOCIO-ECONOMIC DEVELOPMENT CONTRUBUTIONS	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	0	4	4	**36**	**Moderate**	(+)	High
With Mitigation	4	3	0	4	5	**55**	**Moderate**	(+)	High
Mitigation and Management Measures	— The proponents should liaise with the LM and KHLM to identify projects that can be supported by SED contributions. — 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 SED contributions								

VISUAL IMPACT AND IMPACT ON SENSE OF PLACE

The proposed WEF will impact on the areas existing rural sense of place. However, the impact on the areas sense of place should be viewed within the context of the site's location within the Komsberg REDZ, existing and proposed renewable energy projects and Eskom powerlines.

The proposed site is located within the Komsberg REDZ and Central Transmission Corridor. The area has therefore been identified as suitable for the establishment of large scale renewable energy facilities and associated grid infrastructure. In this regard three operational WEFs (Perdekraal East, Roggeveld and Karusa WEF) are located within 35km of the proposed site. The area is also affected by the existing Eskom transmission lines. The visual character of the area has therefore been substantially altered by existing WEFs and transmission lines in the area. The Brandvalley and Rietkloof WEFs have also been awarded preferred bidder status in 2021 and construction is expected to commence in 2022. In addition, none of the directly affected and or adjacent landowners interviewed raised concerns about potential visual impacts associated with the proposed expansion project.

The **visual impact and impact on sense of place** is shown in **Table 7-75**.

Table 7-75: Operational Impact on Visual impact and impact on sense of place

Potential Impact: VISUAL IMPACT AND IMPACT ON SENSE OF PLACE	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	2	3	4	4	**44**	**Moderate**	(-)	High
With Mitigation	2	2	3	4	4	**44**	**Moderate**	(-)	High
Mitigation and Management Measures	— The recommendations contained in the VIA should also be implemented. — Install radar activated civil aviation light system.								

IMPACT ON PROPERTY VALUES

Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low, specifically for farms that are farmed as productive farms.

The findings of the SIA indicate that traditional farmers, specifically those on whose property renewable energy projects are located, support the development of renewable energy. The projects create an opportunity to generate additional income which can be used to support their farming operations. The establishment of renewable energy facilities therefore enhances their property values. However, landowners who have acquired properties as lifestyle farms are less supportive of the development of large-scale renewable energy facilities, specifically wind farms, due to the impact on the areas sense of place. The impact on sense of place also includes night time impacts associated with aviation lights. The development of WEFs therefore has the potential to impact negatively on the property values of lifestyle properties.

The **impact on property values** is shown in **Table 7-76**.

Table 7-76: Operational Impact on property values

Potential Impact: IMPACT ON PROPERTY VALUES	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	2	0	4	3	**24**	**Low**	(-)	High
With Mitigation	2	2	0	4	3	**24**	**Low**	(-)	High
Mitigation and Management Measures	— The recommendations contained in the VIA should also be implemented. — Install radar activated civil aviation light system.								

IMPACT ON TOURISM IN THE REGION

Based on the findings of the SIA there the only significant local tourist facility in the area is self catering accommodation located on Standvastigheid 210/RE (Saaiplaas) owned by Mr Francois Conradie. Mr Conradie indicated that the guest accommodation facility has been fully booked out to contractors since the start of WEF construction activities in the area and is still fully booked for the foreseeable future. The establishment of REFs

in the area has therefore benefitted to the local tourism industry, specifically given the impact associated with Covid-19 pandemic. In addition, based on the findings of the literature review and the SIA there is limited evidence to suggest that the proposed WEF would have a significant impact on the tourism in the LM at a local and regional level. The findings of the literature review also indicate that wind farms do not impact on tourist routes.

The **impact on tourism in the region** is shown in **Table 7-77**.

Table 7-77: Operational Impact on tourism in the region

Potential Impact: / IMPACT ON TOURISM IN THE REGION	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	1	2	0	4	3	**21**	**Low**	(-)	High
With Mitigation	1	2	0	4	3	**21**	**Low**	(-)	High
Mitigation and Management Measures	— The recommendations contained in the VIA should also be implemented. — Install radar activated civil aviation light system.								

7.15 HEALTH AND SAFETY

7.15.1 CONSTRUCTION PHASE

During construction, the employees are exposed to health and safety hazards from the mechanical machines and equipment used on the site. Furthermore, there is a potential for snakes and other dangerous animals in the area, to which the employees must be warned about and trained on how to handle situations if any encounters occur. The construction impact on health and safety is indicated in **Table 7-78** below.

Table 7-78: Construction Impact on Employee Health and Safety

Potential Impact: / EMPLOYEE HEALTH AND SAFETY	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)	High
With Mitigation	2	1	3	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	— An HSE officer must be appointed to monitor safety conditions during construction activities; — Ensure employees are properly trained to use specific equipment or machinery; — Train personnel on how to deal with snake encounters, as well as encounters with other dangerous animals known to occur in the area; — Provide suitable personal protective equipment (PPE); — Conduct site and safety induction to raise awareness of the risks associated with the site; — Conduct regular toolbox talks as refreshers to improve health and safety; — Develop safe work instruction method statements that should be used by employees in completing their tasks; — Train all relevant personnel on handling, use and storage of hazardous substances;								

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
EMPLOYEE HEALTH AND SAFETY								
	— Provide Material Safety Data Sheets (MSDS) for all hazardous substances kept onsite; and — All visitors should undergo site induction and be made aware of the risks associated with the site.							

7.15.2 OPERATIONAL PHASE

The operational phase health and safety impacts are expected to be limited to loading and unloading of heavy equipment as well as via the storage and handling of any hazardous material onsite. The impact is expected to be low following mitigation and is indicated in **Table 7-79** below.

Table 7-79: Operation Impact on Employee Health and Safety

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
EMPLOYEE HEALTH AND SAFETY									
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)	High
With Mitigation	2	1	3	4	2	**20**	**Low**	(-)	High
Mitigation and Management Measures	— The HSE officer will monitor safety conditions during activities; — Ensure employees are properly trained to use specific equipment or machinery; — Train personnel on how to deal with snake encounters, as well as encounters with other dangerous animals known to occur in the area; — Provide suitable PPE; — Conduct site and safety induction to raise awareness of the risks associated with the site; — Conduct regular toolbox talks as refreshers to improve health and safety; — Develop safe work instruction method statements that should be used by employees in completing their tasks; — Train all relevant personnel on handling, use and storage of hazardous substances; — Provide MSDSs for all hazardous substances kept onsite; and — All visitors should undergo site induction and be made aware of the risks associated with the site.								

7.15.3 DECOMMISSIONING PHASE

The impacts are anticipated to be similar to the assessed for the construction phase.

7.16 CONCURRENT OPERATION OF THE ESIZAYO WEF AND EXPANSION

It is the intention of the developer to combine the currently authorised Esizayo WEF with this Expansion Project such that a single WEF can be operated and managed. The Esizayo WEF was authorised in July 2017. The impact significance of the original project was considered to be medium – low.

Based on the above impact assessment for the expansion of the Esizayo WEF, the impact significance of the expansion project is also considered to be medium – low.

The approach is to undertake concurrent construction activities allowing for the use of shared infrastructure such as the O&M building, substation and powerline. This approach allows the developer to achiever lower environmental impacts.

The combined significance of operating the greater Esizayo WEF is therefore considered to be medium-low.

7.17 NO-GO ALTERNATIVE

The 'no-go' alternative is the option of not constructing the Esizayo Expansion WEF and associated infrastructure, where the status quo of the current status and/or activities on the project sites would prevail. This alternative would result in no additional impact on the receiving environment.

Should the 'no-go' alternative be considered, there would be no impact on the existing environmental baseline and no benefits to the local economy and affected communities. The alternative also bears the opportunity cost of missed socio-economic benefits to the local community that would otherwise realise from establishing the farms which form part of the project sites.

The option of not developing also entails that the bid to provide renewable/clean energy to the national grid and contribute to meeting the country's energy demands will be forfeited.

The primary goal of the Project is to assist in providing additional capacity to Eskom to assist in addressing the current energy supply constraints. The project also aims to reduce the carbon footprint associated with energy generation. As indicated above, energy supply constraints and the associated load shedding have had a significant impact on the economic development of the South African economy. South Africa also relies on coal-powered energy to meet more than 90% of its energy needs. South Africa is therefore 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 carbon emissions. The 'no-go' Alternative would represent a lost opportunity for South Africa to improve energy security and supplement is current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost.

However, the 'no-go' alternative will result in the current status quo being maintained. The low human population in the area is definitely advantageous to sensitive avifauna and terrestrial fauna and flora, especially Red Data species and SCCs. The 'no-go' option would eliminate any additional impact on the ecological integrity of the proposed WEF development site.

8 CUMULATIVE IMPACT ASSESSMENT

Although the BA process is essential to assessing and managing the environmental and social impacts of individual projects, it often may be insufficient for identifying and managing incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process "*will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence*" including "*master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant*."

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC GPH).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC's Performance Standards specify that "*Risks and impacts will be analysed in the context of the project's area of influence. This area of influence encompasses…areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.*" (IFC 2006).

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

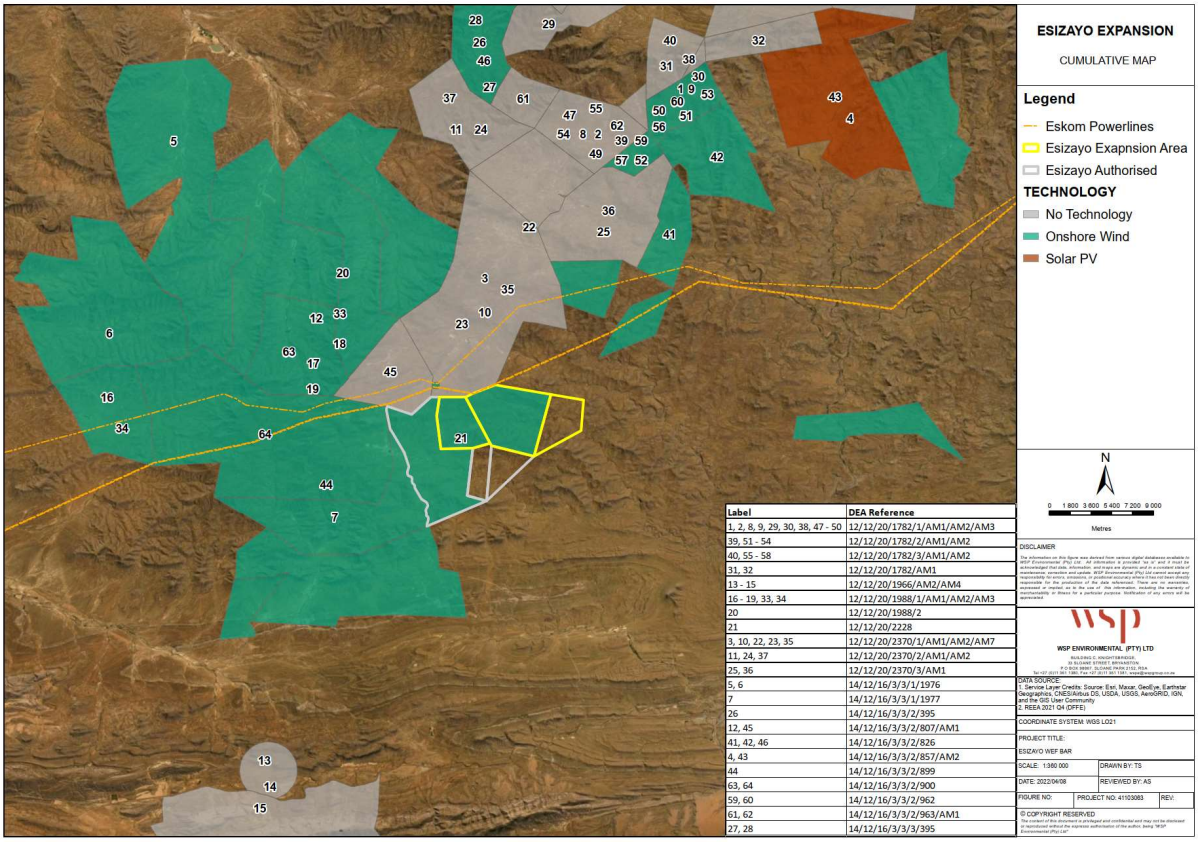
Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed WEF Expansion. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Potential cumulative impacts identified are summarised below. Other planned or existing projects that can interact with the Project will be identified during stakeholder engagement and finalisation of the BA process.

According to the official database of DFFE, there are currently 23 registered applications for renewable wind energy projects within a 30km radius around the proposed development **(Figure 8-1** and **Table 8-1**). The following projects are preferred bidders:

- Roggeveld Wind Project (currently under construction);
- Perdekraal Wind Project (currently under construction);
- Hidden Valley Wind Project (Karusa and Soetwater wind farms (currently under construction);

— Rietkloof Wind Project (to be constructed in due course); and
— Brandvalley Wind Project (to be constructed in due course).



Label	DEA Reference
1, 2, 8, 9, 29, 30, 38, 47 - 50	12/12/20/1782/1/AM1/AM2/AM3
39, 51 - 54	12/12/20/1782/2/AM1/AM2
40, 55 - 58	12/12/20/1782/3/AM1/AM2
31, 32	12/12/20/1782/AM1
13 - 15	12/12/20/1966/AM2/AM4
16 - 19, 33, 34	12/12/20/1988/1/AM1/AM2/AM3
20	12/12/20/1988/2
21	12/12/20/2228
3, 10, 22, 23, 35	12/12/20/2370/1/AM1/AM2/AM7
11, 24, 37	12/12/20/2370/2/AM1/AM2
25, 36	12/12/20/2370/3/AM1
5, 6	14/12/16/3/3/1/1976
7	14/12/16/3/3/1/1977
26	14/12/16/3/3/2/395
12, 45	14/12/16/3/3/2/807/AM1
41, 42, 46	14/12/16/3/3/2/826
4, 43	14/12/16/3/3/2/857/AM2
44	14/12/16/3/3/2/899
63, 64	14/12/16/3/3/2/900
59, 60	14/12/16/3/3/2/962
61, 62	14/12/16/3/3/2/963/AM1
27, 28	14/12/16/3/3/3/395

Figure 8-1: Renewable energy applications within 30km of the proposed Esizayo WEF Expansion project.

Table 8-1: Renewable energy applications within 30km of the proposed Esizayo WEF Expansion project

LABEL	DEA_REF	PROJECT TITLE	MEGAWATT	PROJECT STATUS
29, 30, 38, 47, 48, 49,50, 1, 2, 8, 9	12/12/20/1782/1/AM1/AM2/AM3	140 Megawatts (MW) Rietrug Wind Energy Facility near Sutherland, Northern Cape Province	140	Approved
39,51,52,53,54	12/12/20/1782/2/AM1/AM2	140 Megawatts (MW) Sutherland Wind Energy Facility near Sutherland, Northern Cape Province and Western Cape Provinces	140	Approved
40,55,56,57,58	12/12/20/1782/3/AM1/AM2	140 Megawatts (MW) Sutherland 2 Wind Energy Facility near Sutherland Wind Energy, Northern Cape Province and Western Cape Provinces	140	Approved

LABEL	DEA_REF	PROJECT TITLE	MEGAWATT	PROJECT STATUS
31,32	12/12/20/1782/AM1	Proposed development of renewable Energy facility at the Sutherland site, Western and Northern Cape province	0	Approved
13,14,15	12/12/20/1966/AM2/AM4	Proposed establishment of the Witberg Bay wind energy facility, Laingsburg Local Municipality, Central Karoo District, Western cape	120	Approved
16,17,18,19,33,34	12/12/20/1988/1/AM1/AM2/AM3	Proposed Construction Of The 750 Mw Roggeveld Wind Farm Within The Karoo Hoogland Local Municipality Of The Northern Cape Province And Within The Laingsburg Local Municipality Of The Western Cape Province	750	Approved
20	12/12/20/1988/2	Proposed Construction Of The 140Mw Roggeveld Wind Farm Within The Karoo Hoogland Local Municipality Of The Northern Cape Province And Within The Laingsburg Local Municipality Of The Western Cape Province	140	Approved
21	12/12/20/2228	Proposed wind energy facility near Komsberg, Western Cape	0	Withdrawn/Lapsed
22,23,35,10,3	12/12/20/2370/1/AM1/AM2/AM7	Proposed Hidden Valley wind energy facility , Northern cape	650	Approved
24,37,11	12/12/20/2370/2/AM1/AM2	Proposed Hidden Valley wind energy facility , Northern cape	150	In process
25,36	12/12/20/2370/3/AM1	Proposed Hidden Valley wind energy facility , Northern cape	150	In process
5,6	14/12/16/3/3/1/1976	Proposed development of the 325MW kudusberg wind Energy facility and associated infrastructure in Western and Northern Cape Provinces	325	Approved
7	14/12/16/3/3/1/1977	Proposed development of the 140MW Rietkloof wind energy facility and associated infrastructure near Matjiesfontein in the Western Cape	140	Approved
26	14/12/16/3/3/2/395	Proposed 280 MW Gunstfontien Wind energy Facility, Northern Cape Province	280	Approved

LABEL	DEA_REF	PROJECT TITLE	MEGAWATT	PROJECT STATUS
12,45	14/12/16/3/3/2/807/AM1	The Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its Associated Infrastructure within the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Northern and Western Cape Provinces	140	Approved
41,42,46	14/12/16/3/3/2/826	Environmental Authorisation for the 200 MW Gunstfontein Wind Energy Facility on the Remainder of the Farm Gunstfontein 131 South of the Town of Sutherland Within the Karoo Hoogland Local Municipality In The Northern Cape Province	200	Approved
4,43	14/12/16/3/3/2/857/AM2	275 MW Komsberg East Wind Energy Facility near Sutherland within the Karoo Hoogland and Lainsgburg Local Municipalities in the Northern and Western Cape Provinces.	275	Approved
44	14/12/16/3/3/2/899	140 MW Rietkloof WE, near Sutherland, NC_WC	140	Approved
63,64	14/12/16/3/3/2/900	147MW Brandvalley wind energy facility North of the town of Matjiesfontein within Karoo Hoogland	147	Approved
59,60	14/12/16/3/3/2/962	140MW Maralla East wind energy facility in Lainsburg, Northern and Western Cape provinces	140	Approved
61,62	14/12/16/3/3/2/963/AM1	140 Maralla West wind energy facility in Lainsburg, Westrn Cape	140	Approved
	14/12/16/3/3/2/967	140 Esizayo wind energy facility in Lainsburg, Westrn Cape	140	Approved
27,28	14/12/16/3/3/3/395	Proposed renewable Gunstfontien energy Facility, Northern Cape Province	-	Approved

AVIFAUNA

The proposed Esizayo Expansion WEF will consist of 23 turbines in total. According to information that could be sourced from the internet, the number of wind turbines that have been approved within a 35km radius in broadly similar habitat around the proposed WEF, therefore, the maximum number of turbines that could potentially be constructed in this area is 672. Although it might be that the actual number is less, the precautionary principle must be applied, and it must be assumed that it could be the case. If the Esizayo Expansion WEF is approved, the number increases to 695 turbines, of which the Esizayo Expansion WEF will contribute 3.3%. As such, the WEFs'

contribution to the total number of turbines, and by implication to the cumulative impact of all the planned turbines, is very low.

The total area of similar habitat available to birds in the 35km radius around the project sites is approximately 3 848 km². This translates into approximately 1 turbine/5.5km². The density of turbines, should all the turbines be constructed, and by implication the cumulative impact on avifauna of the currently approved wind energy projects within this area is considered to be medium to high, although the impact could be reduced to medium, if the recommended mitigation at the various projects is diligently implemented.

BIODIVERSITY

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This section describes the cumulative potential impacts of the project on biodiversity. Cumulative impacts are assessed in context of the extent of the proposed development area and its associated impacts, other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

The proposed Esizayo WEF expansion is located within the Cape Floristic Region (CFR) Biodiversity Hotspot. The CFR is an exceptionally important region for plant biodiversity globally. Approximately 69% of the estimated 9 000 plant species in the CFR are restricted (endemic). Diversity and endemism are also high at the genus and family, as the CFR possesses five families that are endemic to South Africa. The CFR comprises of several vegetation types, and the two overlapping the development area comprise of Renosterveld and Succulent Karoo. In congruency with other Biodiversity Hotspots on a global scale, the wellbeing of the CFR has been negatively affected by climate change, landcover change and invasions by alien species (Bellard et al, 2014). Albeit research has focused on avifauna and volant fauna, the influence of WEFs on non-volant herpetofauna and mammals is scarce, especially within southern Africa, but nevertheless have been reported (Lovich & Ennen, 2013).

Presently, the surrounding immediate and broader landscape consists of natural vegetation used for supporting livestock and to a lesser extent game, with energy generation and distribution facilities and infrastructure, as well as a road network. The infrastructure footprint of the proposed development overlaps with the Central Mountain Shale Renosterveld, a vegetation type that is approximately 118 762 ha in extent, as indicated by the remnants spatial file (Skowno et al, 2019). The South African Renewable Energy EIA Application Database (DFFEb, 2021) was used to determine the presence and extent of additional energy facilities within the surrounding landscape. This database contains spatial data for renewable energy applications for environmental authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications. Data is captured and managed on a parcels level as well as aggregated to the project level at the boundary level. **Figure 8-2** illustrates the developments within the vegetation type, and the proximal landscape.

The direct impact footprint of WEFs in proportion to area required is typically minimal. Within the landscape, the authorised Esizayo, Karusa, Soetwater and Kareebosch WEFs account for approximately 0.5% of direct habitat loss. However, the cumulative effects of WEF operational activities on fauna are more concerning. Habitat fragmentation is a key driver of species loss and has the potential to contribute to the problems associated with habitat loss and fragmentation even though a matrix of relatively undisturbed habitat can exist among turbines and other infrastructure (Lovich & Ennen, 2013). Donaldson et al (2002) demonstrated that the abundance of pollinator species, such as Butterflies (Papilionoidea), Bees (Anthophila) and Monkey Beetles (Scarabaeidae: Hopliini) was significantly affected by fragment size, synergistically with other factors such as vegetation cover. Fragment size and distance to large remnants of vegetation had a significant influence on seed or fruit set in four of the seven plant species that were examined. Furthermore, one of the study species failed to set any seed small- and medium- sized fragments. Consequently, habitat fragmentation will lead to a loss in the floral diversity, potential recovery after fires and resilience to anthropogenic impacts. Several important pollinators were recorded within the PAOI as well as the surrounding landscape, during the present and previous surveys (**Figure 8-3**), and therefore severe habitat fragmentation is likely to be detrimental to the wellbeing of the vegetation. However, the physical characteristic of the proposed development alone is unlikely to severely fragment habitat, but cumulative impacts within the landscape will lead to fragmentation.

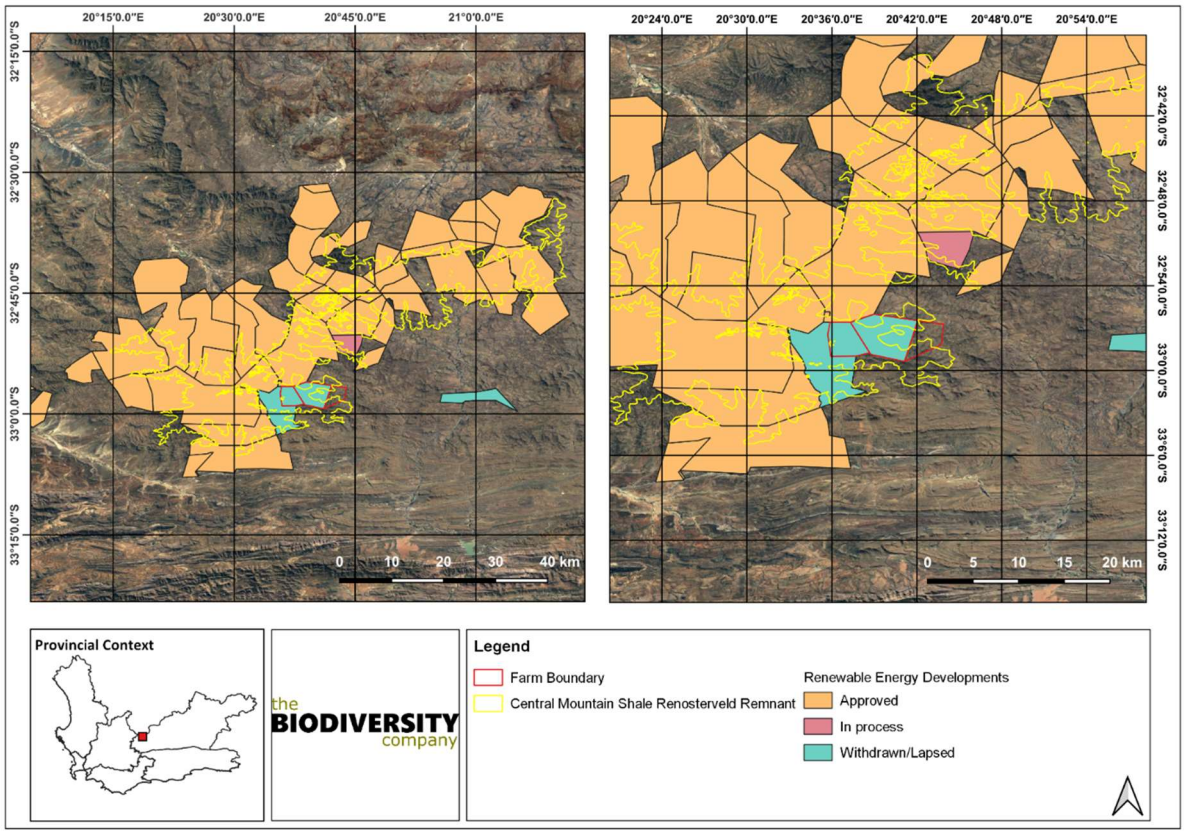


Figure 8-2: Map illustrating renewable energy developments overlapping the remnant Central Mountain Shale Renosterveld (left) and renewable energy developments proximal to the proposed Esizayo Wind Energy Facility Expansion Area (Source: The Biodiversity Company, 2021)

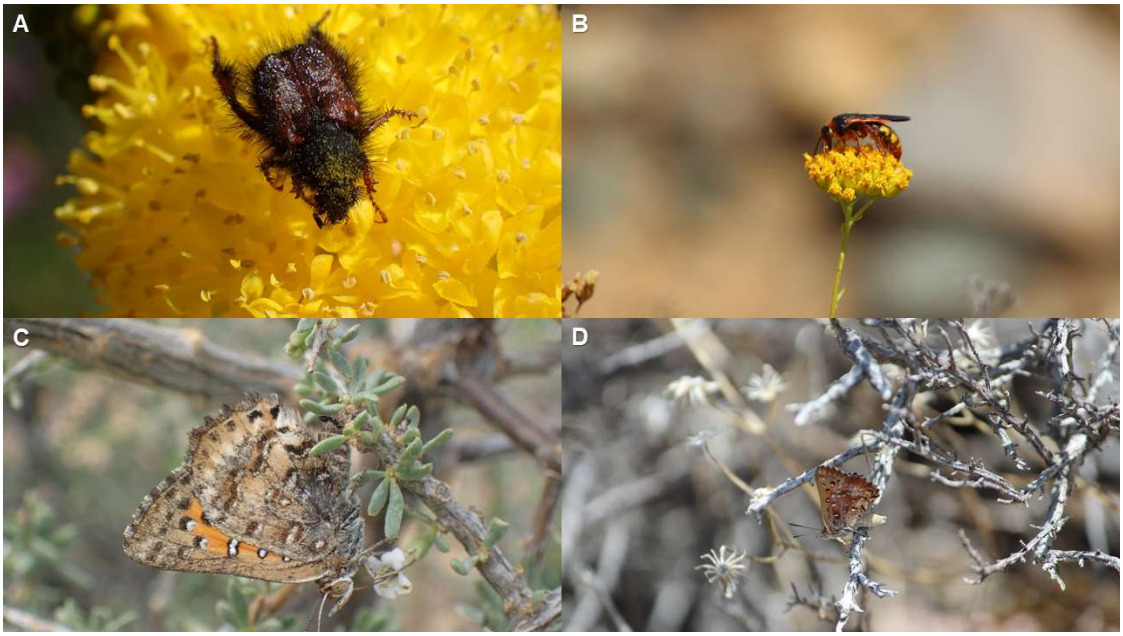


Figure 8-3: Photographs illustrating a portion of the pollinator species recorded within the proposed Esizayo Wind Energy Facility Expansion Area PAOI and proximal landscape. A) *Hopliini (Scarabaeidae)* consuming and distributing pollen of Bulbinella latifolia ssp. latifolia, B) *Scolia (Scoliidae)* nectaring on *Chrysocoma ciliata*, C) *Aloeides vansoni* (*Lycaenidae*) nectaring on *Lycium schizocalyx* and D) *Aloeides pierus (Lycaenidae)*

Wind energy developments on a large scale also influence micro-climate and generally occur downwind of an operating wind farm due to enhanced vertical mixing from rotor turbulence (Roy & Traiteur, 2010). The study determined that near-surface air temperatures can be higher at night and during early morning hours and lower during the day, with the effect exhibited 18–23 km downwind of the facility. Areas downwind of a WEF may experience altered wind, precipitation and evaporation patterns, increased lake temperatures and minor changes in soil moisture (Abbasi & Abbasi, 2000). These changes have the potential to affect fauna, especially herpetofauna species with environmental sex determination and narrow sex determining thresholds (Lovich & Ennen, 2013). In consideration of the aforementioned impacts, the expected cumulative impact is expected to be of a 'High' significance (**Table 8-2**).

Table 8-2: Assessment of cumulative impact on biodiversity

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
CUMULATIVE IMPACT FROM WIND ENERGY FACILITIES WITHIN THE ROGGEVELD	3	3	3	4	5	65	High	(-)	High

SOILS

The general area for which the proposed development is planned is very extensive (non-intensive) farmland. Only the potential impacts of erosion and sedimentation and contamination are likely to cumulatively add to those of surrounding farmland, and only if mitigation and monitoring requirements are not undertaken adequately.

HERITAGE

Cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area / region that affect the same resources and / or receptors'.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities.

Multiple human activities in the surrounding landscape, of which the proposed expansion of Esizayo WEF is the latest, can erode the integrity of these heritage resources through their physical damage or destruction. At an individual project level these impacts may not appear to be significant, but the cumulative effects of multiple developments on heritage resources are expected to be moderate (negative). The implementation of measures at individual project level can, however, do much to mitigate and reduce cumulative impacts to low (negative).

PALAEONTOLOGY

Cumulative impacts inferred for the various alternative energy developments in the Klein-Roggeveldberge region between Matjiesfontein and Sutherland have been previously assessed by Almond (2016f) on the basis of desktop and field-based palaeontological impact assessment reports for these projects, the great majority of which were submitted by the present author. Relevant published palaeontological literature for the region has also been taken into account (e.g. Loock et al. 1994). This assessment applies only to the construction phases of the WEF developments, since significant additional impacts on palaeontological heritage during the operational and de-commissioning phases are not anticipated. The projects concerned in the earlier cumulative impact analysis by Almond (2016f) lie within a radius of some 50-70 km of the Esizayo WEF project area. WEF projects within a smaller, 30 km radius of the Esizayo WEF Expansion project are highlighted by the black circle in Figure 45 (From Almond 2021b).

In all the strictly relevant field-based palaeontological studies in the Klein-Roggeveld region the palaeontological sensitivity of the project area and the palaeontological heritage impact significance for the developments concerned has been rated as low. In all cases it was concluded by the author that, despite the undoubted occurrence

of scientifically-important fossil remains (notably fossil vertebrates, vertebrate trackways and burrows, petrified wood), the overall impact significance of the proposed developments was low because the probability of significant impacts on scientifically important, unique or rare fossils was slight. While fossils do indeed occur within some of the formations present, they tend to be sparse – especially as far as fossil vertebrates are concerned - while the great majority represent common forms that occur widely within the outcrop areas of the relevant sedimentary rock units and are hence not of high scientific or conservation significance. Important exceptions include (1) local concentrations of exceptionally well-preserved fossil logs in the Waterford Formation and (2) vertebrate burrows attributed to small therapsids, and possibly also to lungfish (Almond 2016b, Almond 2016c). Well-preserved vertebrate trackways made by temnospondyl amphibians or other, unidentified tetrapods found c. 35 km north of the Esizayo WEF project area (Almond 2016e) are not really relevant here because they occur within significantly younger sediments of the Abrahamskraal Formation.

Cumulative impacts for the Esizayo WEF Expansion in the context of comparable alternative energy projects proposed or authorised in the Klein-Roggeveldberge region were assessed. It is concluded that the cumulative impact significance of the proposed new development and other regional projects (including the authorized Esizayo WEF) is LOW (NEGATIVE), provided that the proposed monitoring and mitigation recommendations made for all these various projects are followed through. Unavoidable residual negative impacts may be partially offset by the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a positive impact for Karoo palaeontological heritage. However, without mitigation the magnitude and probability of cumulative (negative, direct) impacts of such a large number of WEFs affecting the same (albeit sparsely) fossiliferous rock successions would be significantly higher. The cumulative impact significance without mitigation is accordingly assessed as MEDIUM (NEGATIVE). These anticipated levels of change are considered to lie within acceptable limits.

TRAFFIC

The DFFE requested that a cumulative transport impact assessment be undertaken of the latent power facilities in the vicinity of the Esizayo Expansion WEF.

Refer to **Table 8-3** for the facilities that were assessed in terms of their potential cumulative transport impact on the road network. This was assessed in combination with the Esizayo facility. The facilities listed below will potentially also take access off the R354 during their construction and operational phases.

Table 8-3: Latent developments in the study area

DEA NUMBER	NAME	TYPE	ACCESS TO MAJOR ROAD NETWORK
12/12/20/1782	Sutherland 2 WEF*	Wind Energy	Via Klein Roggeveld access road to R354
12/12/20/1988/1/AM1	Roggeveld Wind Farm**	Wind Energy	Via local access roads to R354
12/12/20/2370 & 12/12/20/2370/2	Hidden Valley wind energy facility***	Wind Energy	Via Klein Roggeveld access road to R354
14/12/16/3/3/2/962 & 14/12/16/3/3/2/963	Maralla East & West ****	Wind Energy	Via Klein Roggeveld or Komsberg access roads to R354
14/12/16/3/3/2/967	Esizayo WEF	Wind Energy	Via local access roads to R354

Notes:

* The Sutherland 2 WEF site is the western of the 4 sites and is the only facility that was assessed as it will take access off the R354 via the Klein Roggeveld or Komsberg access roads.

** The eastern sites located closest to the R354 were assessed, as these will take access off the R354.

*** The development will consist of 3 phases, namely the Karusa, Soetwater and Great Karoo Wind Farms.

**** Recently approved, EIA undertaken by WSP

Refer to **Table 8-4** for the expected cumulative transport impacts on the local road network due to the latent facilities in the study area.

Table 8-4: Summary of transport impacts of the latent developments

DEA NUMBER	FACILITY	TRANSPORT IMPACT	CUMULATIVE TRANSPORT IMPACT
12/12/20/1782	Sutherland 2 WEF	— The EIR do not state the expected number of vehicle trips that will be generated by the facility. — The EIA does not contain a TIA.	No cumulative impact due to maximum traffic generation of each site occurring at an unknown future time period that cannot be determined with the information available.
12/12/20/1988/1/AM 1	Roggeveld Wind Farm	— The EIR do not state the expected number of vehicle trips that will be generated by the facility. — The EIA does not contain a TIA. — The EIA states that 4 access roads off the R354 will be considered.	
12/12/20/2370 & 12/12/20/2370/2	Hidden Valley wind energy facility *	— The EIR do not state the expected number of vehicle trips that will be generated by the facility. — The EIA does not contain a TIA.	
14/12/16/3/3/2/962 & 14/12/16/3/3/2/963	Maralla East & West	— Safety of local access intersections off the R354 to Klein Roggeveld and Komsberg may be compromised due to increased construction traffic. — Mitigating measures are proposed.	
14/12/16/3/3/2/967	Esizayo WEF	— Safety of local access intersections off the R354 to the sites may be compromised due to increased construction traffic. — Temporary mitigating measures are proposed.	

VISUAL

The cumulative visual impact of the proposed Esizayo WEF Expansion Project and an additional six authorised WEFs will primarily be restricted to an approximate 11km radius from the Komsberg MTS.

The cumulative visual impact is expected to be high, depending on the observer's sensitivity to wind turbine structures. In spite of this, the cumulative visual impact is still considered to be within acceptable limits, due to the generally remote location of the Komsberg REDZ and the relatively limited number of affected sensitive visual receptors.

SOCIAL

SENSE OF PLACE

The potential cumulative impacts on the areas sense of place will be largely linked to potential visual impacts. In this regard the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues are also likely to be relevant to solar facilities and associated infrastructure, including the proposed WEF. The relevant issues identified by Scottish Natural Heritage study include:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g., the effect of seeing two or more wind farms along a single journey, e.g., road or walking trail).
- The visual compatibility of different wind farms in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g., viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time, but if each successive stretch of the road is dominated by views of renewable energy facilities, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

A number of operational WEFs (Perdekraal East, Roggeveld and Karusa WEF) are located in the study area. The site and general area are also traversed by existing Eskom 400 kV and 765 kV transmission lines. Added to this the Brandvalley and Rietkloof WEFs were awarded preferred bidder status in 2021 and construction is expected to commence in 2022. The potential for cumulative impacts is therefore high.

However, the cumulative impact on the areas sense of place should be viewed within the context of the site's location within the Komsberg REDZ and Central Transmission Corridor. The area has therefore been identified as suitable for the establishment of large scale renewable energy facilities and associated grid infrastructure. The visual character of the area has also already been substantially altered by existing WEFs and transmission lines in the area. Cumulative visual impacts on the areas sense of place cannot therefore be avoided.

LOCAL SERVICES AND ACCOMMODATION

The objective will be to source as many low and semi-skilled workers for the construction phase from the LM. This will reduce the pressure on local services and accommodation and the nearby towns of Laingsburg, Matjiesfontein and Sutherland. However, as indicated above, based on experience the number of local members of the community employed during the construction phase for the existing projects in the area has been limited.

For a single WEF / SEF project ~70 skilled workers and 400 low to semi-skilled workers require accommodation. In the event of the construction phase for 2-3 projects overlapping, the total number of workers requiring accommodation would be between 1 200 and 1 500. A review of potential accommodation options indicates that there are in the region of 900-1 000 opportunities available in Laingsburg, Matjiesfontein, Sutherland Touws River.

However, many of the accommodation facilities are relatively small, do not provide meals, or services such as laundry etc. The logistics associated with managing ~ 400 workers associated with a single project (transport to and from site, meals, laundry, off-site medical complaints, etc.) accommodated in a range of facilities scattered around the towns of Laingsburg, Touws River and Sutherland are therefore likely to be create a number of logistics related challenges. In addition, many of the smaller accommodation facilities cater for tourists (Sutherland) and travellers (Laingsburg, Touws River) and as such may be reluctant to provide accommodation for semi and low skilled workers over an extended period of 10 or more months. There is therefore insufficient accommodation available in Laingsburg, Matjiesfontein, Sutherland and Touws River to accommodate construction workers associated with 2 or more projects. The cumulative impacts on accommodation and local services (health care, clinics etc.) will therefore be significant.

There is therefore a need to provide new accommodation and up-grade local services. Based on the discussions with the Laingsburg, Breede Valley and Karoo Hoogland Municipality, both Municipalities are in favour of accommodating workers in town as opposed to outside of town, as is the case with the construction camp established on a farm for the Karusa WEF.

In this regard the Laingsburg, Breede Valley and Karoo Hoogland Municipality indicated that the benefits to the local economy outweighed the potential negative impacts associated with accommodating construction workers in the towns. Two options were identified in the discussions with the Laingsburg, Breede Valley and Karoo Hoogland Municipality, namely:

- Use existing underutilised facilities / buildings in Laingsburg, Touws River and Sutherland.

- Establishment of new facility/s to accommodate construction workers. In this regard the Laingsburg, Breede Valley, and Karoo Hoogland Municipality indicated that they would work with contractors to identify potentially suitable sites (with a focus on municipal owned land) and expedite the planning approval process.

In terms of upgrading and expanding local services, such as clinics, hospitals etc. Discussions should be held with the Provincial Department of Health. The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and associated renewable energy projects in the LM. These benefits will create opportunities for investment in the LM, including the opportunity to up-grade and expand existing services and the construction of new houses. Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed WEF is also required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the LM to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning process undertaken by the Laingsburg LM and KHLM.

LOCAL ECONOMY

In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed WEF, will also create several socio-economic opportunities for the LM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities. The review of the REIPPPP (June 2020) indicates that the SED contributions associated with 68 operational projects has amounted to R 1.2 billion to date. In terms of Enterprise Development (ED), R 7.2 billion has been committed for BW1 to BW4, 1S2 and 2S2. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R360 million per annum. Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. Up until the end of June 2020 a total of R 384.2 million had already been made to the local communities located in the vicinity of the 68 operating IPPs. This represents 93% of the total R384.2 million enterprise development contributions made to date).The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

9 ENVIRONMENTAL IMPACT STATEMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "*development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…*". NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed Esizayo WEF Expansion, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, and the relevant legislation (where applicable).

The conclusions of this BA are the result of comprehensive assessments. These assessments were based on issues identified through the BA process and public participation undertaken to date. The BAR will be subject to public review, which will be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The BAR will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

9.1 ENVIRONMENTAL SENSITIVITIES

The following environmental sensitivities were identified on the site, as a result of the Project location and proposed activities and will require specific applications or measures for mitigation to minimise impact.

- **Biodiversity:**
  - CBA & ESA
  - Critically endangered and endangered species
  - Critical habitat
- **Avifauna:**
  - High value habitat unit
  - Presence of sensitive species such as Martial Eagle
- **Freshwater:**
  - Aquatic CBAs
  - Wetland features
  - Freshwater ecosystem priority areas
- **Palaeontology:**
  - Features with very high paleontological sensitivity
- **Bats:**
  - Wetland features
- **Flicker:**
  - Inhibited residences
- **Landscape:**
  - Mountain tops and high ridges

The above sensitivities are discussed in the sub-sections below. The combined environmental sensitivities of the proposed WEF Expansion Project footprint are shown in **Figure 9-1** below.

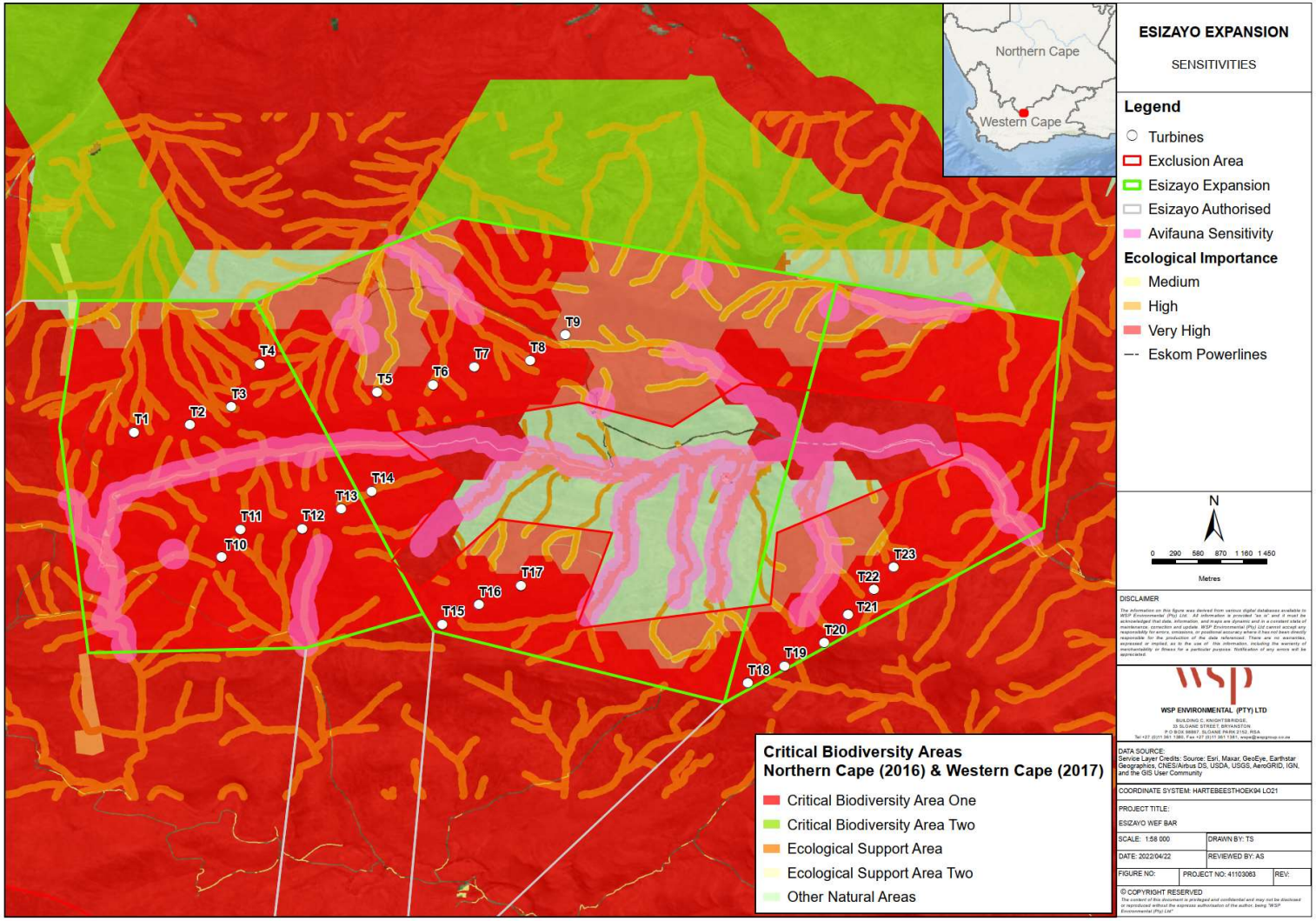
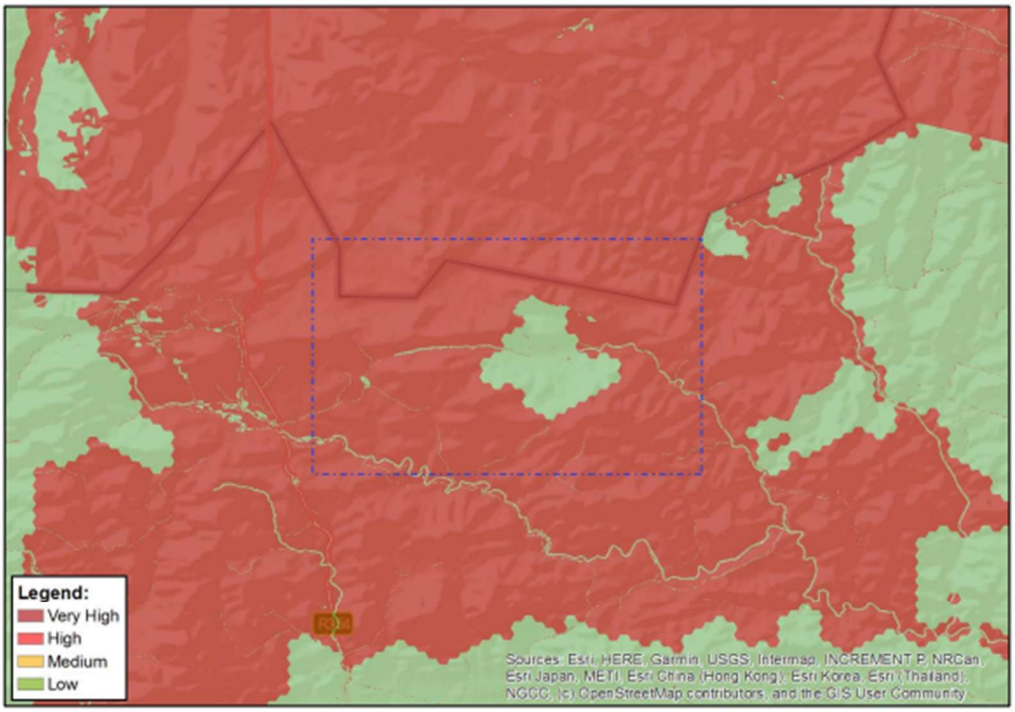


Figure 9-1: Combined Sensitivity Map

9.1.1 BIODIVERSITY

The Combined Terrestrial Biodiversity Theme Sensitivity for the PAOI as indicated in the screening report was derived to be 'Very High' (**Figure 9-2**). This is attributed to the area being included in the BSP as a CBA1, ESA1 and ESA2, as well as being a FEPA sub-catchment.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Ecological support area 2
Very High	Critical biodiveristy area 2
Very High	Ecological support area
Very High	FEPA Subcatchments

Figure 9-2: Terrestrial Biodiversity Theme Sensitivity, DEA Screening Report

All habitats within the assessment area of the proposed development were allocated a sensitivity category, i.e., a SEI category (**Table 9-1**). The SEI categories provided are based on a multi-taxon (flora, herpetofauna and non-volant mammalia) context. The SEI of the habitat types delineated within the assessment area is illustrated in **Figure 9-3**.

Table 9-1: Summary of the Site Ecological Importance for the proposed Esizayo WEF Expansion Area PAOI

HABITAT	AREA (HA)	CONSERVATION IMPORTANCE	FUNCTIONAL INTEGRITY	BIODIVERSITY IMPORTANCE	RECEPTIOR RESILIENCE	SITE ECOLOGICAL IMPORTANCE
Drainage Line[9]	3 296.080	Medium	Very High	High	Medium	High
Moderately Steep Rocky Slope	3 249.495	High	Very High	Very High	Low	Very High
Plain	369.437	Medium	High	Medium	Medium	Medium
Plateau	111.528	High	Very High	Very High	Low	Very High
Steep Rocky Slope	710.836	High	Very High	Very High	Low	Very High

The guidelines for interpreting SEI as provided in the Species Assessment Protocol (SANBI, 2020) in the context of the proposed development is provided in **Table 9-2**.

Table 9-2: Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

SITE ECOLOGICAL IMPORTANCE	INTERPRETATION IN RELATION TO PROPOSED DEVELOPMENT ACTIVITES
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.

[9] Note that for this assessment, a 100 m corridor (50 m buffer) was applied to the drainage lines as provided in Macfarlane *et al* (2009). "The need for wide buffers is supported by a range of other authors, with common buffer widths for maintaining habitat connectivity for general wildlife movement ranging between 50 and 300m, depending on the landscape context and species concerned" (Macfarlane *et al*, 2009). These corridors are presented in the relevant map.

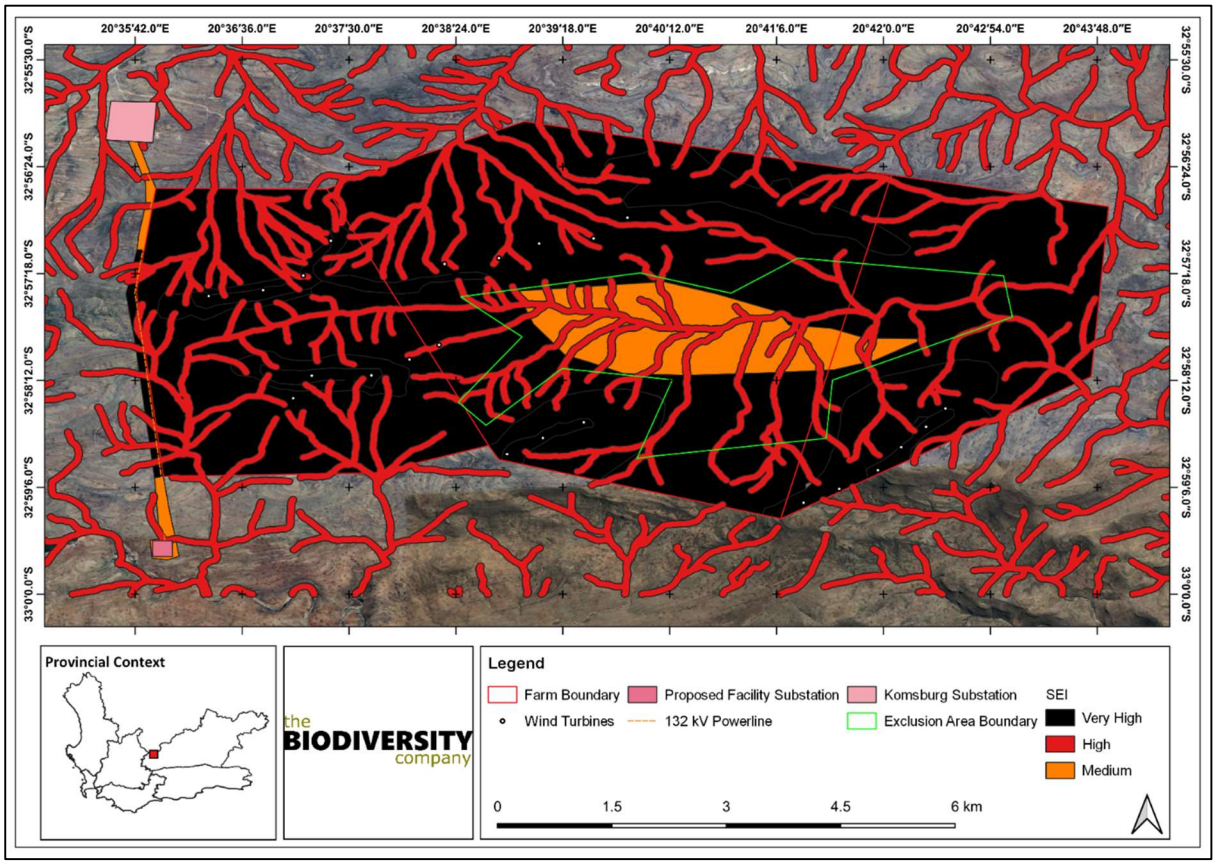


Figure 9-3: Map illustrating the Site Ecological Importance (SEI) of the habitats delineated within the proposed Esizayo Wind Energy Facility Expansion Area PAOI

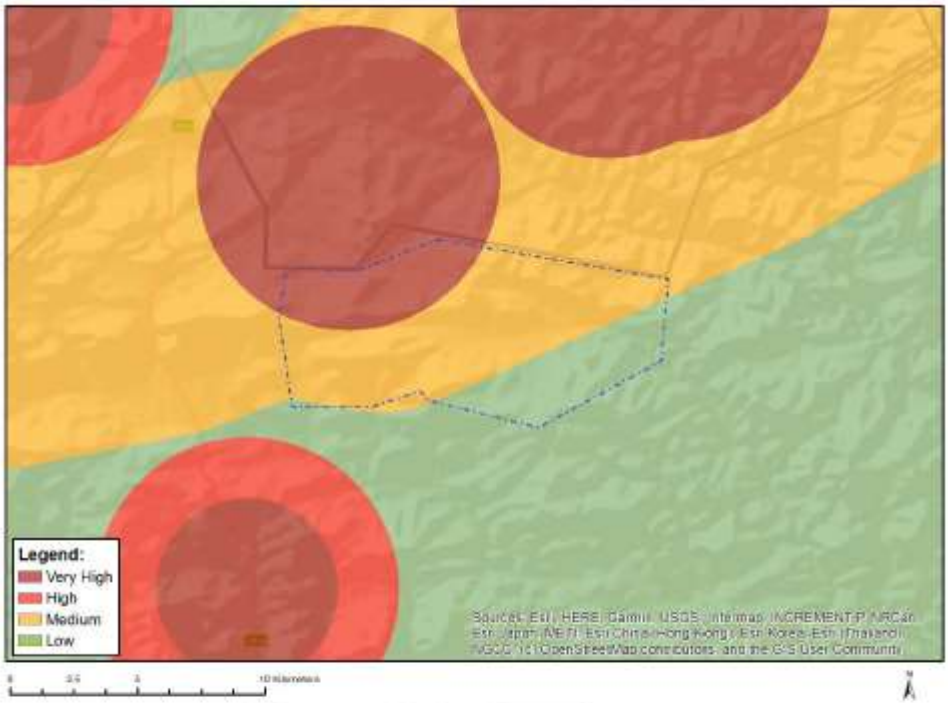
It is acknowledged that the project falls within a very high sensitivity area, however, the specialist has demonstrated that the opportunities for the avoidance of specific habitats together with the implementation of mitigation measures have resulted in moderate to low post-mitigation impact significance.

9.1.2 AVIFAUNA

According to the DFFE national screening tool, the habitat within the development site is classified as a mixture of Low, Medium and High sensitivity for birds according to the Avian Wind theme (see **Figure 9-4**). This classification is partially accurate as far as the impact of the proposed WEFs is concerned, based on actual conditions recorded on the ground during the 12 months of pre-construction monitoring.

The classification should be High for the whole site based on the recorded presence of Species of Conservation Concern (SCC) i.e. Vulnerable and Endangered Red List wind priority species at the development site, Ludwig's Bustard (Regionally and Globally Endangered), Martial Eagle (Regionally and Globally Endangered), Verreaux's Eagle (Regionally Vulnerable), Lanner Falcon (Regionally Vulnerable), Southern Black Korhaan (Regionally and Globally Vulnerable), Secretarybird (Regionally Vulnerable, Globally Endangered), Black Harrier (Regionally and Globally Endangered) and Black Stork (Regionally Vulnerable).

MAP OF RELATIVE AVIAN (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Area Outside Sensitivities
Medium	within 5 km of power line ≥ 132kV
Very High	within 5 km of Martial Eagle nests;within 5 km of power line ≥ 132kV

Figure 9-4: Avian Theme Sensitivity for wind development, DEA Screening Report

The following environmental sensitivities were identified from an avifaunal perspective for the Esizayo Expansion WEF:

- **High sensitivity No-turbine buffer: Surface water.**

  Included in this category are areas within 200m of water troughs and earth dams, and 150m from all major drainage lines. Surface water in this arid habitat is crucially important for priority avifauna, including several Red Data species such as Verreaux's Eagle, Martial Eagle, Lanner Falcon, Secretarybird, Black Stork, Greater Flamingo and many non-priority species, including several waterbirds. Drainage lines when flowing attract waterbirds on occasion, as do the large pools that remain in the channel after the flow has stopped. Wind turbines that are placed near these sources of surface water pose a collision risk to birds using the water for drinking and bathing, and drainage lines, when flowing, are natural flight paths for birds.

Figure 9-5 indicates the turbine exclusion zones for the Esizayo Expansion WEF.

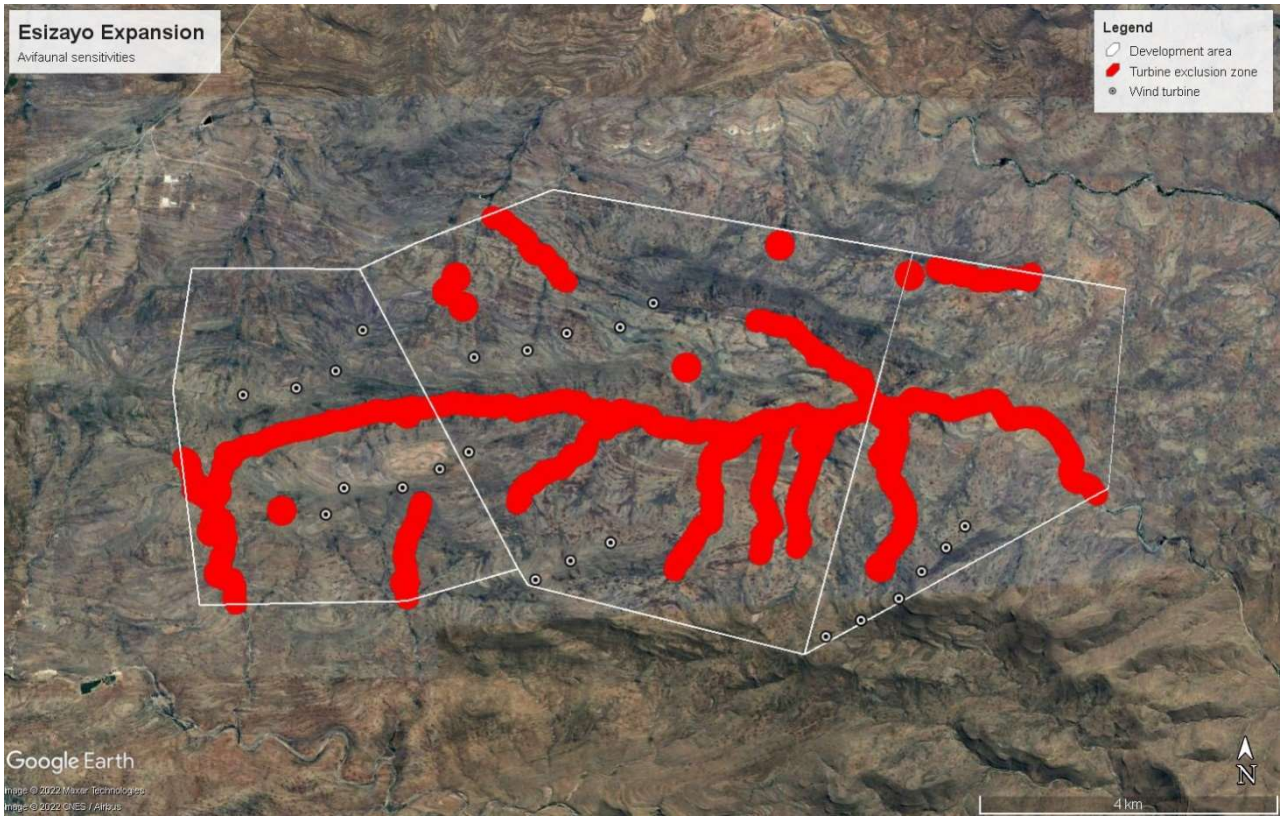
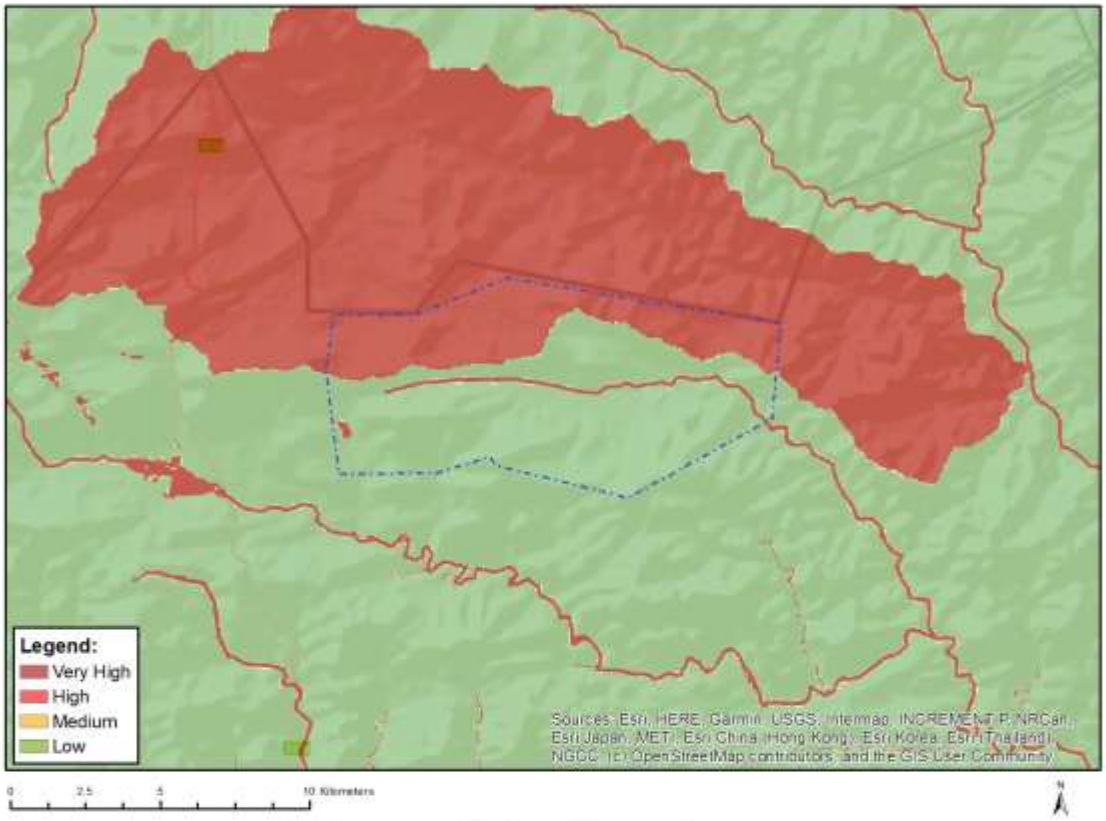


Figure 9-5: **Proposed no-turbine zones for the Esizayo Expansion WEF**

9.1.3 FRESHWATER

The DFFE National Screening Tool classifies parts of the study area as 'Very High' due to the presence of aquatic CBAs, Rivers, Wetland and Estuaries as well as Freshwater ecosystem priority areas (**Figure 9-6**).

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

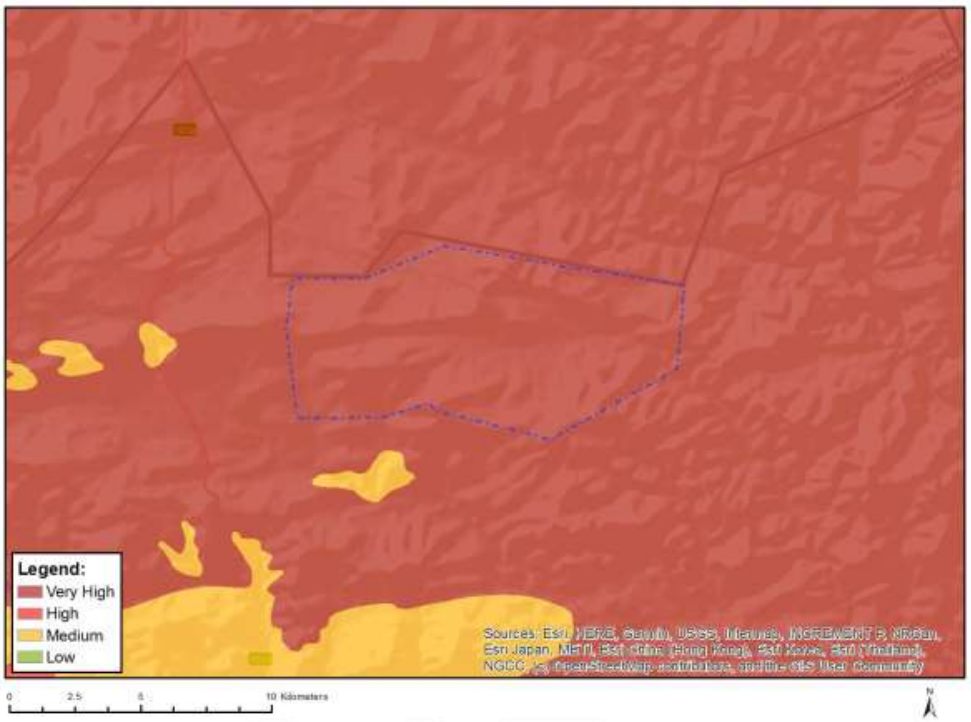
Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Aquatic CBAs
Very High	Rivers
Very High	Wetlands and Estuaries
Very High	Freshwater ecosystem priority area quinary catchments

Figure 9-6: The DFFE screening tool rating for the Aquatic Biodiversity Theme

9.1.4 PALAEONTOLOGY

The DFFE National Screening Tool classifies parts of the study area as very high sensitivity due to the presence of features with a very high palaeontological sensitivity **(Figure 9-7**).

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Features with a Very High paleontological sensitivity

Figure 9-7: The DFFE screening tool rating for the Palaeontological Theme

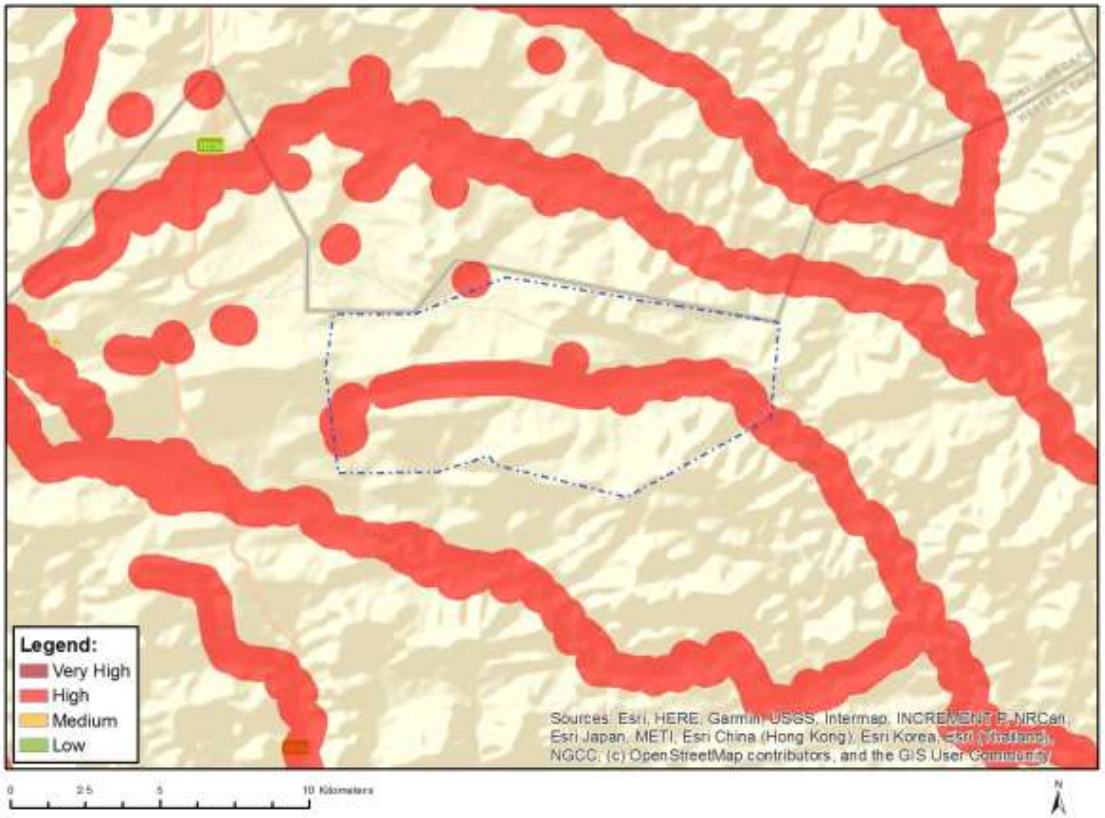
No vertebrate or vascular plant body fossil remains were recorded during the recent site visit to the Esizayo WEF Expansion project area. All of the fossils observed so far within the project area are of widely-occurring forms that are not considered to be of exceptional scientific or conservation value (see Proposed Field Rating IIIC Local Resource in Appendix 1). None of the known fossil sites lies within the provisional wind turbine footprint and no No-Go or High Sensitivity areas have been identified here in terms of palaeontological heritage. Direct impacts on the known fossil sites are unlikely and no mitigation is recommended in regard to them.

It is concluded that the overall palaeontological sensitivity of the Esizayo WEF Expansion project area is in practice LOW. The provisional High to Very High Palaeosensitivity mapped on the SAHRIS palaeosensitivity map and DFFE Screening Tool for this part of the Klein-Roggeveld is therefore contested here. However, the potential for hitherto unrecorded, very rare sites of High Palaeosensitivity (e.g., tetrapod skeletal remains and trackways) cannot be completely excluded.

9.1.5 BATS

The DFFE National Screening Tool classifies parts of the study area as 'High Sensitivity' due to being within 500 m of a wetland (**Figure 9-8**).

MAP OF RELATIVE BATS (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 500 m of a river
High	Wetland
High	Within 500 m of a wetland

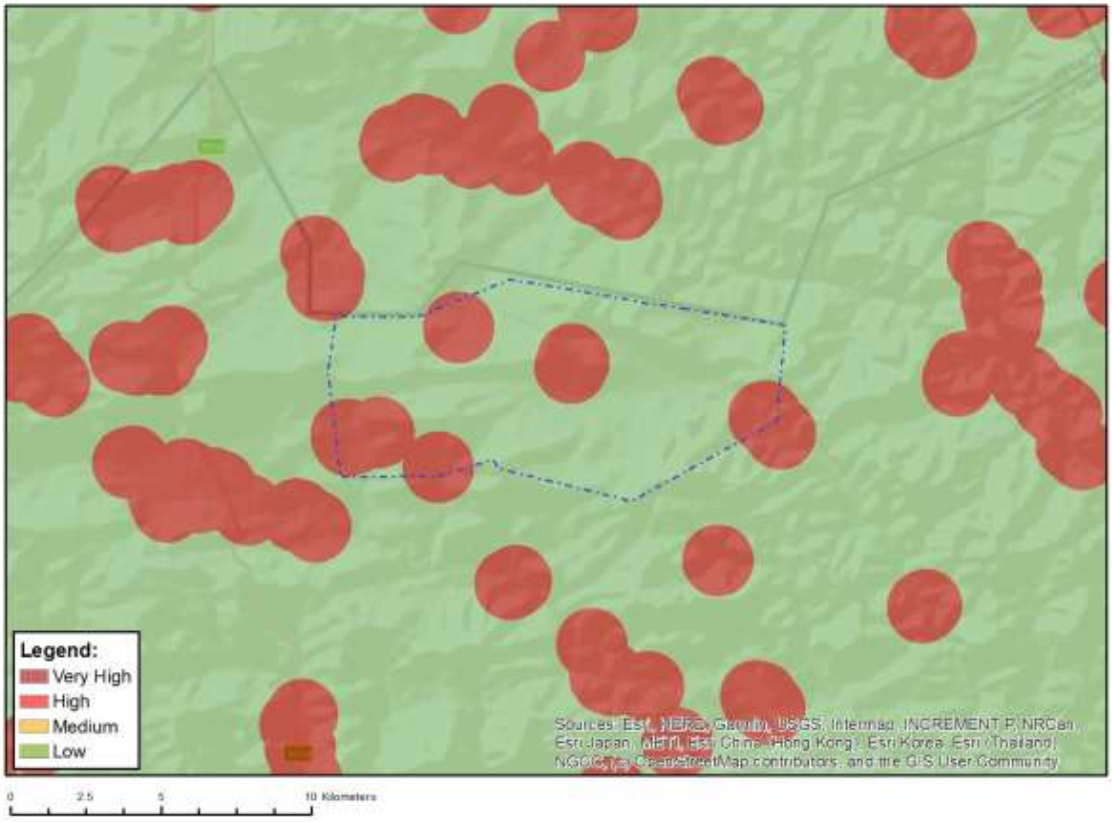
Figure 9-8: The DFFE screening tool rating for the Bats (Wind) Theme

The Esizayo WEF should be designed to avoid areas with known or anticipated high bat activity (such as along drainage lines). The mitigation measures recommended by Animalia (2016) are applicable.

9.1.6 FLICKER

The DFFE National Screening Tool classifies parts of the study area as very high sensitivity due to the potential temporarily or permanently inhabited residence (**Figure 9-9**).

MAP OF RELATIVE FLICKER THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Area of low sensitivity
Very High	Potential temporarily or permanently inhabited residence

Figure 9-9: The DFFE screening tool rating for the Flicker Theme

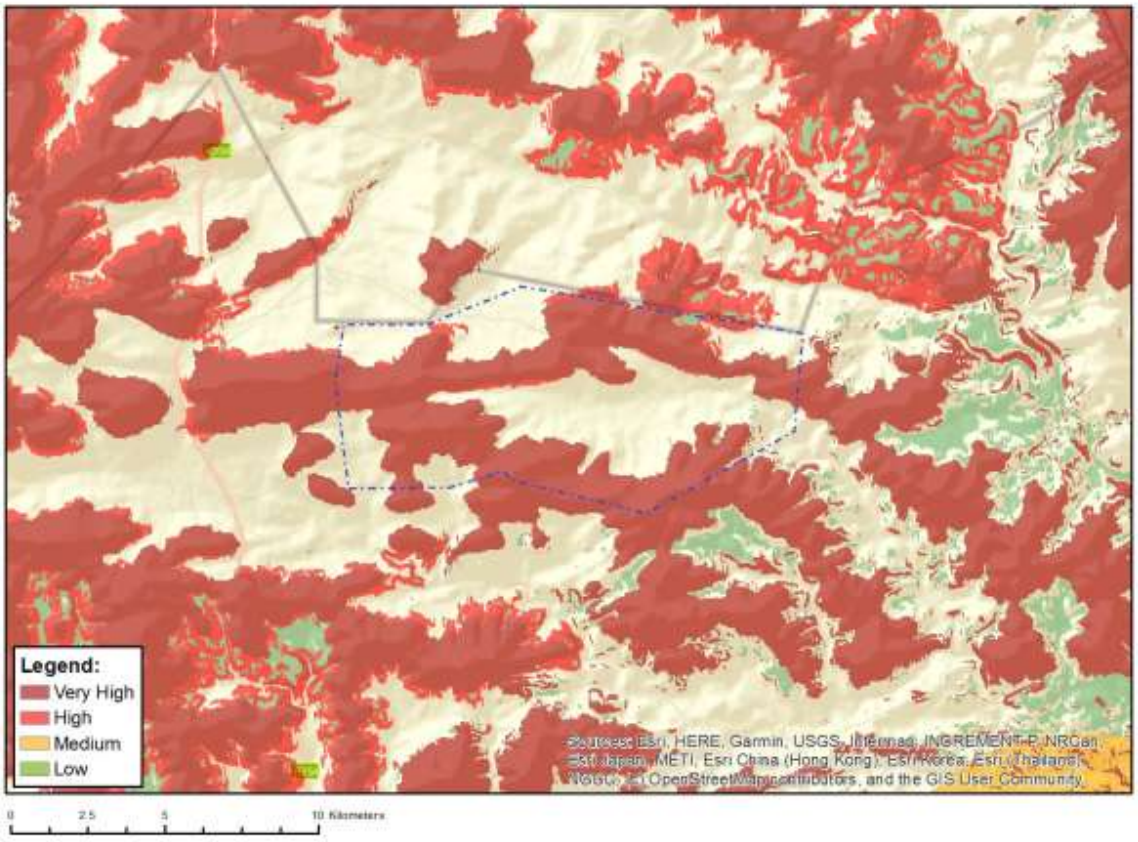
Shadow flicker only occurs when the sky is clear, and when the turbine rotor blades are between the sun and the receptor (i.e. when the sun is low). De Gryse in Scenic Landscape Architecture (2006) found that "most shadow impact is associated with 3-4 times the height of the object". Based on this research, an 1,000m buffer along the edge of the outer most turbines is identified as the zone within which there is a risk of shadow flicker occurring.

There are no places of residence within the 1,000m buffer. The significance of shadow flicker is therefore anticipated to be **low to negligible.**

9.1.7 LANDSCAPE

The DFFE National Screening Tool classifies parts of the study area as 'Very High Sensitivity' due to it being in an area with high ridges and mountain tops with slopes more than 1:4 **(Figure 9-10)**.

MAP OF RELATIVE LANDSCAPE (WIND) THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Slope between 1:4 and 1:10
Low	Slope less than 1:10
Very High	Slope more than 1:4
Very High	Mountain tops and high ridges

Figure 9-10: The DFFE screening tool rating for the Landscape Theme

9.2 SPECIALIST CONCLUSIONS

9.2.1 AVIFAUNA ASSESSMENT

The proposed Esizayo Expansion WEF could have a moderate impact on avifauna which, in most instances, could be reduced to a low through appropriate mitigation, although some moderate residual impacts will still be present

after mitigation. No fatal flaws were discovered during the onsite investigations. The proposed WEF development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

9.2.2 BIODIVERSITY ASSESSMENT

The aim of this Biodiversity Impact Assessment was to provide information to guide the risk of the proposed Esizayo WEF Expansion to the ecosystems and their inherent fauna and flora.

Based on the latest available ecologically relevant spatial data the following information is pertinent to the project area:

- It is recognised as a Critical Biodiversity Area (CBA) as per the Western Cape CBA database;
- The Combined Animal Species Theme Sensitivity was rated as 'Very High' according to the Environmental Screening Tool; and
- The Ecosystem Protection Level for the vegetation types associated with the development footprint are regarded as Not Protected.

The habitats present within the PAOI are diverse and considered to be heterogenous in physiognomy and possesses an array of micro-habitats. Due to the high habitat diversity, the area supports a relatively high diversity of flora and fauna. In addition, the PAOI supports several SCC, including a globally endangered species with a low dispersal ability. Based on the presence of SCC, the functional integrity and its low resilience to change, three of the delineated coarse-scale habitats, i.e., Moderately Steep Rocky Slope, Plateau and Steep Rocky Slope were determined to exhibit a 'Very High' SEI. A 200 m radial buffer is generally associated with drainage features, and designated high sensitivity areas.

Knowledge of impacts to non-volant fauna communities from operational activities, especially noise and vibration pollution, are limited in South Africa. It is recommended that further research in this subject be undertaken, and that the developer plays a role in enabling research.

The main expected impact of the proposed Esizayo Wind Energy Facility Expansion will be the loss of habitat and emigration of fauna. Based on the outcomes of the SEI determination, the PAOI possesses a 'Very High' SEI. This denotes that no destructive activities are to occur within these habitats and that offsetting is not an option, with only avoidance mitigation measures permitted. However, the PAOI has been designated as a REDZ (Renewable Energy Development Zone) with surrounding energy developments and this being a proposed expansion to an already existing WEF. It is the opinion of the specialist that the authorisation of the proposed expansion be carefully considered in discussion/consultation at a forum level with the relevant stakeholders including DFFE, Cape Nature, Endangered Wildlife Trust (EWT) and Western Cape Government.

It is important to consider that as renewable development and associated mining (components require that raw materials be mined) expands, eventually areas of critical biodiversity importance will be encroached upon. Based on the 'Very High' SEI of the project area and the presence of SCC, especially *C. boulengeri*, the following actions must be included as part of the Environmental Authorisation:

- The areas to be developed must be specifically demarcated to prevent movement into surrounding environments;
- The developer must fund or partially-fund and enable research into the biology and ecology of *Chersobius boulengeri* within their project areas. The research must include pre-construction, construction and operational phase spatial ecology and behaviour. The developer along with a research institution should devise a study plan with relevance to long-term survivability;
- To compensate for the loss in biodiversity, the surrounding areas should be used as set-aside areas in discussion with the landowners and the relevant conservation authority. This will ensure that no further habitat loss occurs within the PAOI; and
- The Search and Rescue is an essential component in order to limit biodiversity loss. Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area. Monitoring of survivability of SCC that have been relocated is essential, especially if relocated within the southern exclusion area. It is further recommended that a qualified Biodiversity specialist is present during initial clearance activities, as well as adhoc visits. The Biodiversity specialist will provide

relevant training to the on-site ECO to be present at all clearance activities. Furthermore, the ECO will be required to directly communicate with the biodiversity specialist after each clearing event.

9.2.3 FESHWATER HABITAT DELINEATION

Numerous wetland and riparian habitats have been identified across the Project site. The development of the Project does have the potential to negatively impact the surrounding surface water environment, however, the impacts identified are largely associated with ancillary processes and not the establishment of the turbine infrastructure as these will likely be placed on the crest of the hilltops.

Given that the possibility of the Project to negatively impact the surface water environment, adequate mitigation and management procedures are to be adhered to. Loss of wetland habitat, water quality, alteration of the natural flow regimes and erosion and sedimentation have been identified as the predominant negative impacts associated with the proposed Project. Should the recommended mitigative measure be implemented during and after construction, the risk to the surface watercourses may be minimized. Implementation of these measures is not only good practice to ensure the minimisation of degradation, but also necessary to ensure further compliance with the necessary legislative requirements.

Prior to undertaking the proposed activities, construction method statements and emergency response plans must be developed, with specific consideration given to the environment, including wetland habitats. Furthermore, the required authorisation must be attained from the Department of Water and Sanitation.

It is envisaged that the implementation of these measures would provide sufficient mitigation in order to reduce the environmental impact. If the recommended mitigative measures are implemented correctly, including adherence to the DWS Environmental Best Practice Guidelines and the Work Method Statements, the overall significance of the impacts may be reduced.

9.2.4 HERITAGE ASSESSMENT

This assessment has found that the area identified for the proposed Esizayo WEF expansion is a heritage environment of low sensitivity and that impacts on heritage resources arising from the construction of the project are unlikely.

It is our considered opinion that, provided the recommended mitigation measures are implemented, the overall impact and significance of the Esizayo expansion on heritage resources will be negligible and the proposed activity is acceptable

9.2.5 HYDROLOGY ASSESSMENT

The development of the Project may result in negative impacts on the environment. To reduce these impacts, adequate mitigation and management procedures are to be adhered to. Water quality, alteration of the natural flow regimes and possibly erosion and sedimentation have been identified as the predominant negative impacts from the proposed Project. Should the recommended mitigative measure be implemented during and after construction, the risk to the surface watercourses may be minimized. Implementation of these measures is not only good practice to ensure the minimisation of degradation, but also necessary to ensure further compliance with the necessary legislative requirements.

9.2.6 PALAEONTOLOGY ASSESSMENT

All of the fossils recorded so far within the Esizayo WEF Expansion project area are of widely-occurring taxa (sphenophyte ferns, lungfish burrows, low diversity invertebrate trace fossils) that are not considered to be of significant scientific or conservation value. None of the fossil sites recorded during the recent 4-day palaeontological site visit lies within the wind turbine footprints under. Direct impacts on these known fossil sites are therefore not anticipated and no mitigation is recommended in regard to them.

The impact significance of the construction phase of the proposed Esizayo WEF Expansion is assessed as LOW (NEGATIVE) in terms of palaeontological heritage resources. This is a consequence of (1) the paucity of irreplaceable, unique or rare fossil remains within the project area as well as (2) the extensive superficial sediment

cover of low palaeosensitivity overlying most potentially-fossiliferous bedrocks here. This assessment applies equally to all WEF infrastructure layouts under consideration. Significant further impacts during the operational and de-commissioning phases of the WEF are not anticipated. There are therefore no preferences on palaeontological heritage grounds for any particular layout option. The no-go alternative (i.e. no development) will probably have a low (neutral) impact on palaeontological heritage.

Cumulative impacts on palaeontological heritage resources that are anticipated as a result of the numerous renewable energy developments currently proposed or authorised for the Klein-Roggeveldberge region, including the adjoining authorized Esizayo WEF and its electrical infrastructure, are anticipated to be MODERATE (NEGATIVE). Their significance would probably fall to LOW (NEGATIVE) provided that the proposed monitoring and mitigation recommendations made for all these various projects are followed through (cf Almond 2016f, 2021b). These anticipated levels of change fall within acceptable limits.

There are no fatal flaws in the Esizayo WEF Expansion development proposal as far as fossil heritage is concerned. Provided that the recommendations for palaeontological monitoring and mitigation are fully implemented, there are no objections on palaeontological heritage grounds to authorisation of the proposed WEF Expansion. Pending the potential discovery of substantial new fossil remains during construction, specialist palaeontological mitigation is not recommended for this project. The following general recommendations concerning conservation and management of palaeontological heritage resources apply:

- The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the Esizayo WEF Expansion should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint. During the construction phase all major clearance operations and deeper (> 1 m) excavations (e.g. for new internal roads, pylon footings, wind turbine foundations) should be monitored for fossil remains on an on-going basis by the ECO / ESO. Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO / ESO should safeguard these, preferably in situ. They should then alert the relevant provincial heritage resources agency as soon as possible - i.e. Heritage Western Cape (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959. Email: ceoheritage@westerncape.gov.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense. These mitigation recommendations should be incorporated into the Environmental Management Programme (EMPr) for the Esizayo WEF Expansion project.

9.2.7 SOCIO-ECONOMIC ASSESSMENT

The findings of the SIA indicate that the proposed Esizayo WEF expansion project will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phase. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation.

The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phase are likely to be Low Negative with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented.

The Esizayo WEF expansion project is also located within the Komsberg REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities. The establishment of the proposed Esizayo WEF expansion project is therefore supported by the findings of the SIA.

9.2.8 SOILS AND AGRICULTURE POTENTIAL

The proposed development area is currently largely unused and houses areas of bare rock and soil and tufts of natural grass. The soils identified at the site were shallow, stony Mispahs and Glenrosas and the agricultural capability of the site was deemed to be Class VII; Grazing, and is suitable only for Wildlife, Forestry and Light Grazing, owing to its lack of depth, stoniness and A horizon. Using an alternative capability assessment method, no soils-related impediments to establishing WEF turbines were identified.

All potential impacts were deemed to be low post-mitigation. It is thus recommended that mitigation measures are implemented and plans adhered to, and that Erosion and Sedimentation, and Contamination are monitored and managed throughout all phases.

No soils-related fatal flaws are evident for the proposed project – so the 'no-go' scenario is not necessary. There are no areas on site that need to be buffered or avoided from a soils perspective. It is the specialist's opinion that the potential risk to the soils environment as a result of the proposed development is acceptable and no soils-specific conditions need to be added to the authorisation as a result of this study. It is highly recommended that mitigation and monitoring be undertaken, management measures be strictly implemented and that a Storm Water Management Plan be devised for the site and adhered to.

9.2.9 TRAFFIC ASSESSMENT

The following key conclusions and recommendations are relevant:

- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A single short term (2 year) implementation was assumed for analysis purposes.
- There are no known planned road upgrades in the study area.
- There are no known large scale latent developments in the vicinity of the site that may have an impact on the local road network, except for the latent energy developments that were assessed as part of the Cumulative Impact Assessment.
- The site will take access off existing accesses from the R354, a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is recommended that the existing access road to the Kareedoringkraal/Komsberg be utilised for access purposes.
- The R354 is regarded as in "Fair" and "Good" condition in the vicinity of the site, as per the Provincial Government of the Western Cape (PGWC) Department of Transport's 2015 Surfaced Road Condition Assessment.
- Construction and operational phase parking will be accommodated on-site.
- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase, except for the transport of staff.
- The estimated peak trip generation of the facility will be 45 veh/hr in the weekday AM and PM peaks during the Construction phase.
- The trip generation during the Operational phase will be negligible.
- The expected traffic increase on the local access roads during the construction phase could result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of the projects should be borne by the developer.
- The estimated total E80 loading for the duration of the construction period is 0.02648 million, and no mitigating measures are deemed necessary on the R354.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant transport impact on the local access roads will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.
- The transport route/s between the origin of the turbine components and the facility may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.
- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the tower components (masts, blades, rotor nacelles, generators, etc.) are known. These plans should include all aspects such as horizontal and vertical requirements along the routes, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.
- A capacity analysis of the access intersection off the R354 was not undertaken and is not deemed necessary for a development with such low daily and peak hour traffic generation. The safety of thee chosen intersection may be compromised due to the increase in especially heavy vehicle volumes along the R354 and the access

roads. The low current traffic volumes along the R354 and the expected construction traffic volumes does not justify the construction of additional turning lanes. However, recommendations are made to improve the safety of the intersections with additional road signage.

- The overall significance of each impact during the Construction Phase of the facility detailed in is Low without mitigation, and Very Low with mitigation. The impacts are limited to the peak construction period only, site only/local or regional, and fully reversible.
- The proposed mitigating measures are easy to implement and will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and generation of dust on unsurfaced roads.
- Cumulative impact assessment: The maximum traffic generation of the latent sites may occur at an unknown future time period that cannot be determined from the information available. The implementation programme of these sites has also not been determined. It is unlikely that these impacts will occur at the same time, therefore no cumulative transport impact is foreseen. It should be noted that the Significance of the transport impact of each of these facilities is expected to be similar to the Esizayo Expansion facility, namely Low, or Very Low with mitigation.
- The maintenance and repair of the local access roads due to damage by construction vehicles should be the responsibility of each of the developers of the latent energy facilities.

It is concluded that the proposed Esizayo Expansion Wind Energy Facility will have a negligible short-term transport impact on the adjacent road network, and it is recommended that the TIA should be accepted as part of the EIA application.

9.2.10 VISUAL ASSESSMENT

It is expected that the construction and operation of the proposed Esizayo WEF Expansion Project and its associated infrastructure, will have a high visual impact on the study area, especially within a 5km (and potentially up to 10km) radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility. Tourists travelling through the region and residents of homesteads will likely experience visual impacts where the wind turbine structures are visible.

The combined visual impact or cumulative impact of up to seven wind energy facilities (i.e. the proposed Esizayo WEF Expansion Project and six authorised WEFs) is expected to increase the area of potential visual impact within the region. The intensity of visual impact (number of turbines visible) to exposed receptors, especially those located within a 5km (and potentially up to 10km) radius of the proposed Esizayo WEF, is expected to increase when considered in conjunction with the other proposed or authorised WEFs. The fact that these WEFs are located within the remote Komsberg REDZ offsets the significance of this impact to some degree. This is due mainly to the fact that the population density of the region is very low and mostly (in terms of surface area) devoid of sensitive visual receptors.

Overall, the significance of the visual impacts associated with the proposed Esizayo WEF Expansion Project is expected to be high as a result of the generally undeveloped character of the landscape. The facility would be visible within an area that contains certain sensitive visual receptors who could consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along the arterial and secondary roads, residents of rural homesteads and tourists passing through or holidaying in the region.

Conventional mitigation (e.g. such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of the development and the receiving environment. A number of mitigation measures have been proposed (Section 7.4.). The proposed mitigation measures will primarily be effective in terms of mitigating lighting and construction phase visual impacts.

Note: Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility, should it be authorised.

9.2.11 NOISE

Based on the IFC EHS Guidelines for Wind Energy a preliminary modelling exercise was executed using a simple model which assumes hemispherical propagation of noise from each turbine to determine potential impact on receptors within a 2 km radius of the turbines. If LA90 noise levels at all sensitive receptors are below 35 dB(A)

at a wind speed of 10 m/s (at a height of 10 m) during day and night times, this would be sufficient to assess the noise impact of the proposed facility. If LA90 levels at any receptor location are above 35 dB(A) then a more detailed acoustic study will need to be carried out.

Two sensitive receptors (farmhouses) were identified within 2 km of the site, namely FH A (west of the site, with T10 being the nearest turbine (1,520 m away)) and FH B (east of the site, with T8 being the nearest turbine (1,005 m away)). Based on WSP's preliminary model (following the IFC methodology), the following was determined:

- Results indicate that predicted LA90 noise levels during the day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at the FH A receptor. As such, no adverse impacts are anticipated and meeting this condition offers sufficient protection of amenity at this receptor.
- At FH B, however, LA90 noise levels are predicted to be slightly above this 35 dB(A) threshold, indicating that noise from the turbines could create a nuisance or impact at this location. It is therefore recommended that the location of the turbine (i.e. T8) in close proximity of FH B be reconsidered. Such an approach will limit impacts on this receptor and avoid the need for additional, in-depth studies. Alternatively, a more detailed acoustic study will need to be undertaken.

The resultant environmental acoustic risks for sensitive receptor FH A were ranked "low", while for sensitive receptor FH B, risks were ranked "low to medium". Acoustic impacts of WEFs are very site-specific and the impacts are directly assessed using predicted LA90 levels at nearby receptors. The different wind energy developments in the region are located in different areas with their own set of receptor locations. If the impacts on the receptors at the Esizayo site are low, then the impact from the other WEFs on these receptors will be significantly lower based on distance from the source.

9.3 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed project is provided in **Table 9-3** below.

Table 9-3: Impact Summary

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
Air Quality	Generation Of Dust And PM	Construction	**Moderate**	(-)	**Low**	(-)
Noise	Construction impact on Noise	Construction	**Low**	(-)	**Very Low**	(-)
	Operational Impact of Noise on Farmhouse A	Operation	**Low**	(-)	**Low**	(-)
	Operational Impact of Noise on Farmhouse B	Operation	**Moderate**	(-)	**Low**	(-)
Soil Erosion & Contamination	Soil Erosion And Sedimentation	Construction	**High**	(-)	**Low**	(-)
	Change In Surface Profile	Construction	**High**	(-)	**Moderate**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Change In Land Use	Construction	**Moderate**	(-)	**Moderate**	(-)
	Soil Contamination	Construction	**High**	(-)	**Low**	(-)
	Soil Erosion And Sedimentation	Operation	**High**	(-)	**Very Low**	(-)
Freshwater	Alteration Of The Natural Flow Regime	Construction	**Moderate**	(-)	**Low**	(-)
	Water Quality	Construction	**Moderate**	(-)	**Low**	(-)
	Loss Of Wetland And Riparian Functionality (Associated Infrastructure)	Construction	**Moderate**	(-)	**Low**	(-)
	Loss Of Wetland And Riparian Functionality (Access Roads)	Construction	**Moderate**	(-)	**Low**	(-)
	Soil Erosion And Sedimentation	Construction	**Moderate**	(-)	**Low**	(-)
	Alien Vegetation Establishment	Construction	**Low**	(-)	**Very Low**	(-)
	Water Quality	Operation	**Low**	(-)	**Very Low**	(-)
	Loss Of Wetland And Riparian Habitat	Operation	**Low**	(-)	**Very Low**	(-)
	Soil Erosion And Sedimentation	Operation	**Low**	(-)	**Very Low**	(-)
Hydrology	Alteration Of The Natural Flow Regime	Construction	**Moderate**	(-)	**Low**	(-)
	Soil Erosion And Sedimentation	Construction	**Moderate**	(-)	**Low**	(-)
	Water Quality	Construction	**Moderate**	(-)	**Low**	(-)
	Alteration Of The Natural Flow Regime	Operation	**Moderate**	(-)	**Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Soil Erosion And Sedimentation	Operation	**Moderate**	(-)	**Very Low**	(-)
	Water Quality Degradation	Operation	**Moderate**	(-)	**Low**	(-)
Biodiversity	Destruction, Loss And Fragmentation Of Habitats, Ecosystems & Vegetation Community	Construction	**High**	(-)	**Moderate**	(-)
	Introduction Of Alien Species	Construction	**High**	(-)	**Very Low**	(-)
	Destruction Of Threatened Plant Species	Construction	**Moderate**	(-)	**Very Low**	(-)
	Displacement And Fragmentation Of Faunal Community Due To Habitat Loss, Direct Mortalities & Disturbance	Construction	**Moderate**	(-)	**Low**	(-)
	Dust Pollution	Construction	**Moderate**	(-)	**Very Low**	(-)
	Improper Waste Management	Construction	**High**	(-)	**Very Low**	(-)
	Displacement And Fragmentation Of The Faunal Community Due To Habitat Loss, Direct Mortalities & Disturbance	Construction	**Moderate**	(-)	**Moderate**	(-)
	Continued Disturbance Of Vegetation Communities, Especially Threatened Species, And Encroachment By Alien Invasive Plant Species	Operation	**Moderate**	(-)	**Very Low**	(-)
	Erosion Due To Poor Stormwater Management	Operation	**High**	(-)	**Very Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Ongoing Displacement, Direct Mortalities And Disturbance Of Faunal Community Due To Habitat Loss And Disturbances	Operation	**High**	(-)	**Moderate**	(-)
	Increase In Pied Crow (Corvus Albus) Density	Operation	**High**	(-)	**Low**	(-)
Avifauna	Displacement Of Priority Species Due To Disturbance Associated With The Construction Of The Wind Turbines And Associated Infrastructure	Construction	**Moderate**	(-)	**Low**	(-)
	Displacement Due To Habitat Transformation Associated With The Construction	Construction	**Moderate**	(-)	**Moderate**	(-)
	Mortality Of Priority Species Due To Collisions With The Wind Turbines	Operation	**Moderate**	(-)	**Low**	(-)
	Mortality Of Priority Species Due To Collisions With The 33kv Overhead Power Lines	Operation	**Moderate**	(-)	**Moderate**	(-)
	Electrocution Of Priority Species On The On-Site Substation Infrastructure	Operation	**Moderate**	(-)	**Low**	(-)
	Displacement Of Priority Species Due To Disturbance Associated With The Dismantling Of The Wind Turbines And Associated Infrastructure	Decommissioning	**Moderate**	(-)	**Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
Visual	Visual Impact Of Construction Activities On Sensitive Visual Receptors In Close Proximity To The Proposed WEF Infrastructure	Construction	**Moderate**	(-)	**Moderate**	(-)
	Visual Impact on Observers (Residents at Homesteads and Visitors/Tourists) In Close Proximity (I.E. Within 5km) To the Wind Turbine Structures	Operation	**High**	(-)	**High**	(-)
	Visual Impact on Observers Travelling Along the Roads in Close Proximity (I.E. Within 5km) To the Wind Turbine Structures	Operation	**High**	(-)	**High**	(-)
	Visual Impact on Observers Travelling Along the Roads and Residents at Homesteads Within A 5 – 10km Radius of The Wind Turbine Structures	Operation	**Moderate**	(-)	**Moderate**	(-)
	Visual Impact on Observers Travelling Along the Roads and Residents at Homesteads Within A 10 – 20km Radius of The Wind Turbine Structures	Operation	**Moderate**	(-)	**Moderate**	(-)
	Visual Impact of Shadow Flicker on Sensitive Visual Receptors in Close Proximity to The Proposed WEF	Operation	**Low**	(-)	**Low**	(-)
	Visual Impact of Lighting at Night on Sensitive Visual Receptors	Operation	**High**	(-)	**Moderate**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Visual Impact of The Ancillary Infrastructure on Observers in Close Proximity to The Structures	Operation	**Low**	(-)	**Low**	(-)
	The Potential Impact on The Sense of Place of The Region	Operation	**Low**	(-)	**Low**	(-)
Waste	Improper Waste Management	Construction	**Moderate**	(-)	**Low**	(-)
Traffic	Vehicle Engine And Tyre On Road Noise, Dust & Exhaust Fumes	Construction	**Low**	(-)	**Very Low**	(-)
	Vehicle Engine And Tyre On Road Noise, Dust & Exhaust Fumes	Construction	**Low**	(-)	**Very Low**	(-)
	Increase In Vehicle Engine And Tyre On Road Noise & Exhaust Fumes	Construction	**Low**	(-)	**Very Low**	(-)
Heritage	Disturbance, Damage Or Destruction To Heritage Resources	Construction	**Low**	(-)	**Very Low**	(-)
Palaeontology	Disturbance, Damage Or Destruction To Fossil Heritage	Construction	**Low**	(-)	**Low**	(-)
Socio-Economic	Creation Of Employment, Business Development And Skills Development	Construction	**Low**	(+)	**Moderate**	(+)
	Presence Of Construction Workers And Impact On Family Structures And Social Networks	Construction	**Low**	(-)	**Low**	(-)
	Influx Of Job Seekers On Local Community	Construction	**Low**	(-)	**Low**	(-)

ASPECT	IMPACT DESCRIPTION	PHASE	WITHOUT MITIGATION		WITH MITIGATION	
			SIGNIFICANCE	STATUS	SIGNIFICANCE	STATUS
	Risk To Safety, Livestock, And Farm Infrastructure	Construction	**Moderate**	(-)	**Low**	(-)
	Construction Activities	Construction	**Low**	(-)	**Very Low**	(-)
	Risk Of Veld Fires	Construction	**Moderate**	(-)	**Low**	(-)
	Development Of Infrastructure To Improve Energy Security And Support Renewable Sector	Operation	**Moderate**	(+)	**High**	(+)
	Creation Of Employment Opportunities	Operation	**Very Low**	(+)	**Moderate**	(+)
	Generate Income For Affected Landowners	Operation	**Low**	(+)	**Moderate**	(+)
	Socio-Economic Development Contributions	Operation	**Moderate**	(+)	**Moderate**	(+)
	Visual Impact And Impact On Sense Of Place	Operation	**Moderate**	(-)	**Moderate**	(-)
	Impact On Property Values	Operation	**Low**	(-)	**Low**	(-)
	Impact On Tourism In The Region	Operation	**Low**	(-)	**Low**	
Health And Safety	Employee Health & Safety	Construction	**Moderate**	(-)	**Low**	(-)
	Employee Health & Safety	Operation	**Moderate**	(-)	**Low**	(-)

9.4 ALTERNATIVES ASSESSMENT

Alternatives for the current Project are not considered reasonable or feasible as the purpose of this project is for the extension of the already authorised WEF.

The no-go option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with renewable energy given that energy security benefits associated with the proposed Esizayo WEF Expansion are dependent upon the WEF being able to connect to the national grid via the establishment of grid connection infrastructure. Considering South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant socio-economic cost. Accordingly, the no-go option is not deemed viable.

9.5 RECOMMENDATIONS

The following recommendations are made in respect of the proposed Esizayo WEF Expansion Project:

- All proposed mitigation measures included in this BAR and in the EMPr (**Appendix G**) must be implemented in order to reduce possible impacts to an acceptable level.
- It recommended that a detailed geotechnical investigation be undertaken during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:
  - Profiling and sampling exploratory of trial pits to determine founding conditions for the turbine modules, substation and pylons.
  - An investigation to determine the subgrade conditions for internal roads and a materials investigation (if required).
  - Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements.
  - Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes.
  - Dynamic Probe Super Heavy (DPSH) tests and rotary core drilling may be required depending on the soil profiles and imposed loads of the structures
- The Chance Fossil Finds Procedure must be implemented throughout the construction phase of the development
- Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The relevant heritage authority (the HWC) must be contacted immediately in order to determine an appropriate way forward.
- The areas to be developed must be specifically demarcated to prevent movement into surrounding environments;
- The developer must fund or partially-fund and enable research into the biology and ecology of *Chersobius boulengeri* within their project areas. The research must include pre-construction, construction and operational phase spatial ecology and behaviour. The developer along with a research institution should devise a study plan with relevance to long-term survivability;
- To compensate for the loss in biodiversity, the surrounding areas should be used as set-aside areas in discussion with the landowners and the relevant conservation authority. This will ensure that no further habitat loss occurs within the PAOI; and
- The Search and Rescue is an essential component in order to limit biodiversity loss. Relocation can occur within the surrounding areas but at least 500 m from areas directly influenced by development infrastructure. An additional survey must be undertaken within the southern exclusion area to determine the presence of SCC and the feasibility of relocating species to this area in order to reduce the probability of loss from the main project area. Monitoring of survivability of SCC that have been relocated is essential, especially if relocated within the southern exclusion area. It is further recommended that a qualified Biodiversity specialist is present during initial clearance activities, as well as adhoc visits. The Biodiversity specialist will provide relevant training to the on-site ECO to be present at all clearance activities. Furthermore, the ECO will be required to directly communicate with the biodiversity specialist after each clearing event.

9.6 CONCLUSION AND AUTHORISATION OPINION

The overall objective of the BA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed Project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

It is the opinion of WSP that the information contained in this document (read in conjunction the EMPr) is sufficient for the DFFE to make an informed decision for the environmental authorisation being applied for in respect of this Project.

Mitigation measures have been developed, where applicable, for the above aspects and are presented within the EMPr (**Appendix G**). It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

It is acknowledged that the project falls within a very high sensitivity area, with regards to biodiversity, however, the specialist has demonstrated that the opportunities for the avoidance of specific habitats together with the implementation of mitigation measures have resulted in **moderate to low** post-mitigation impact significance.

Considering the findings of the respective studies, no fatal flaws were identified for the proposed Project. Should the avoidance and mitigation measures prescribed be implemented, the post-mitigation significance of the considered impacts for the majority of negative aspects pertaining to the environmental aspects is expected to be **moderate to low**. The only negative aspect with a high rating post-mitigation is the visual impact on observers within 5km of the wind turbine structures, for which no mitigation is possible.

The proposed Esizayo WEF Expansion project area is adjacent to the already authorised Esizayo WEF (DFFE Ref no: 14/12/16/3/3/2/967) and falls within the Central Strategic Transmission Corridor as well as the Komsberg REDZ. It is thus the opinion of the EAP that the Project can proceed, and that all the prescribed mitigation measures and recommendations are considered by the issuing authority.

EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires “where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised” must be included in the BAR.

The EA is required for a period of 10 years from the date of issuance of the EA to the end of the construction period (including rehabilitation), when the proposed activities applied for are completed. This is a reasonable period as it allows for relevant bidding processes which can only commence after issuance of the EA.

It must be noted that the EMPr does include operational mitigation and monitoring requirements. The operational phase is considered to be approximately 20 years post the completion of the construction phase.

10 WAY FORWARD

Esizayo Wind (RF) (Pty) Ltd (Esizayo) proposes to expand the existing authorised Esizayo WEF extent by adding three new land parcels. The Esizayo WEF Expansion Project is proposed to be constructed on Portion 1 of Farm Leeuwenfontein, 71, Remainder of the Farm Leeuwenfontein, 71 and Portion 2 of Farm Aanstoot, 72. This report provides a description of the proposed Project and details the aspects associated with the construction and operation. The report also includes the methodology followed to undertake the BA process. A detailed description on the existing environment (biophysical as well as socio-economic) is provided based on findings from the specialist surveys and existing information. Stakeholder engagement undertaken from the onset of the assessment to date, has been conducted in a transparent and comprehensive manner. This report will be subjected to a public review period in line with NEMA EIA Regulations, 2014 as amended. Outcomes of all comments received from the public review period will be recorded and responded to in the Final BAR. Based on the environmental description, specialist surveys as well as the stakeholder engagement undertaken to date, a detailed impact assessment was undertaken and, where relevant, the necessary management measures have been recommended.

In summary, the BA process assessed both biophysical and socio-economic environments and identified appropriate management and mitigation measures. The biophysical impact assessment revealed that there are no fatal flaws and no significant negative impacts associated with the proposed Project should mitigation and management measures be implemented. In addition, it should be noted that there are positive socio-economic impacts associated with the Project.

The Draft BAR (this report) has been made available for public review from **6 May 2022 to 7 June 2022**. All issues and comments are to be submitted to WSP (as per the contact details provided below) and will be incorporated in the Comments and Response Report (CRR) which will be attached as an appendix to the Final BAR.

The Draft BAR has also been submitted to the competent authorities. It is the opinion of WSP that the information contained in this document is sufficient for the DFFE to make an informed decision for the EA being applied for in respect of this Project.

Please submit all comments or queries to:

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