BASIC ASSESSMENT REPORT FOR THE PROPOSED HIGHLANDS SOUTH WIND ENERGY FACILITY, EASTERN CAPE PROVINCE

On behalf of

Highlands South Wind Energy Facility (RF) (Pty) Ltd

September 2018

DRAFT FOR PUBLIC COMMENT

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PROJECT DETAILS

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Project Applicant:	Highlands South Wind Energy Facility (RF) (Pty) Ltd
Report Status:	Draft Basic Assessment Report

EXECUTIVE SUMMARY OF THE BASIC ASSESSMENT PROCESS FOR THE PROPOSED HGHLANDS SOUTH WIND ENERGY FACILITY

Introduction

WKN Windcurrent South Africa (Ltd) Pty ('the Developer') is proposing the Highlands Wind Energy Facilities (WEFs), and associated infrastructure including grid connection infrastructure (the Proposed Development), located 20 km from the town of Somerset East in the Eastern Cape Province. The area of interest for development within the affected land parcels is approximately 9000 hectares (The Proposed Development Area), and falls entirely within the Cookhouse Renewable Energy Development Zone (REDZ). The Proposed Development aims to generate and produce electricity from renewable wind energy sources in order to supply electricity into the national grid by connecting to an existing Eskom transmission line within the Proposed Development Area.

Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') has been appointed to act as the independent environmental impact assessment practitioner (EAP) to undertake the environmental impact assessment (EIA) process for Environmental Authorisation under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998 – NEMA) as amended, for the Proposed Development.

For the purpose of obtaining Environmental Authorisation (EA), and bidding requirements in the Department of Energy's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), the project has been split into three phases: North, Central and South. A Special Purpose Vehicle (SPV) has been set up for each of the three phases. Each phase will consist of two applications: one for the wind energy facility and one for the respective grid connection. The Proposed Development therefore consists of six components and six separate applications for EA:

- Highlands North Wind Energy Facility (RF) (Pty) Ltd:
    - The Highlands North WEF (up to 85 MW) consisting of up to 17 turbines with a generating capacity of up to 5 MW each (The Proposed Project),
    - Electrical Grid Connection and Associated Infrastructure for Highlands North WEF;
- Highlands Central Wind Energy Facility (RF) (Pty) Ltd:
    - The Highlands Central WEF (up to 70 MW): up to 14 turbines with a generating capacity of up to 5 MW each
    - Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF;
- Highlands South Wind Energy Facility (RF) (Pty) Ltd:
    - **The Highlands South WEF (up to 90 MW): up to 18 turbines with a generating capacity of up to 5 MW each;**
    - Electrical Grid Connection and Associated Infrastructure for Highlands South WEF.

This report pertains to the **Highlands South WEF (up to 90 MW)** consisting of up to 18 turbines with a generating capacity of up to 5 MW each (The Proposed Project).

Should the Proposed Development be bid in the REIPPPP two submissions may potentially be made: The Highlands South WEF will be combined with the Highlands Central WEF **OR** be bid on its own, and the Highlands Central WEF will be combined with Highlands North WEF. Due to these uncertainties the specialist studies have described the baseline environment of the entire Proposed Development Site as the affected environment. The impact assessments however assess the six Proposed Projects individually, as well as cumulatively (as the six components together are likely to be seen as one wind farm).

Highlands South WEF Site Location and Proposed Development Location

The Proposed Highlands South WEF is located approximately 20 km west of the town of Somerset East, bordering the south of the R63 provincial route, approximately 23 km south-east of Pearston, in the Eastern Cape Province. It is located in the Blue Crane Route Local Municipality (BCRLM) in the Sarah Baartman District Municipality (SBDM), previously known as the Cacadu District Municipality. The main settlements in the municipality are Somerset East, which serves as the administrative and commercial centre, Cookhouse and Pearson. The most significant roads passing through the area are the N10, R61, R63, and the R390. The administrative seat of the SBDM is currently located in the Nelson Mandela Bay Metro area.

The Highlands South WEF (up to 90 MW) will consist of up to 18 three-bladed horizontal-axis turbines with a maximum hub height of 135 m and rotor diameter of up to 150 m, with a generating capacity of up to 5 MW each. A maximum height to blade tip of 200 m will be considered. Internal roads will connect the turbines to each other and the onsite substations. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground, where technically and environmentally feasible. Two on-site substations forms part of this application. The final choice of turbine will be dependent on the technology available at the time of construction, project economics and the desired output from the development.

A Feasibility Assessment was conducted by the specialist team prior to the Basic Assessment process. The results of these preliminary assessments advised the development of the proposed project layout for assessment (embedded mitigation). This layout was improved further by the results of the detailed specialist studies conducted, resulting in the Final Mitigated Layout, as the best practicable environmental option submitted for authorisation.

Environmental Legislative Requirements

The EIA Regulations 2014 as amended by GNR 326 of 2017 provide for the control of certain Listed Activities. These activities are listed in Government Notice No. R327 (Listing Notice 1 – Basic Assessment), R325 (Listing Notice 2 – Scoping & EIA Process) and R324 (Listing Notice 3 – Basic Assessment) of 7 April 2017, and are prohibited to commence until environmental authorisation has been obtained from the competent authority, in this case, the Department of Environmental Affairs (DEA).

Listed Activities applicable to this proposed project are presented in the table below. All potential impacts associated with these Listed Activities are considered and assessed in this EIA.

On 16 February 2018, the Minister of Environmental Affairs promulgated new regulations in terms of Chapter 5 of the NEMA, Government Notices (GN) No. R. 114 in Government Gazette No. 41445 of 16 February 2018. These state that applications for environmental authorisation for large scale wind energy facilities, when such facilities trigger activity 1 of GN No.325 (Listing Notice 2), and where the entire proposed facility is to occur in a REDZ must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the EIA Regulations 2014, as amended, in order to obtain environmental authorisations, as required, in terms of the Act. Further, the timeframe for decision-making as contained in the EIA Regulations, 2014, as amended, for the purposes of the applications for environmental authorisation is 57 days.

Therefore, a Basic Assessment (BA) process will be followed for the application for environmental authorisation for the Highlands South WEF.

Applicable Listed Activities in terms of the NEMA

LISTING NOTICE	ACTIVITIES
LN 1 GN R327[1]	11(i); 12 (ii)(a)(c); 19; 24 (ii); 27; 48 (i)(a)(c) 56 (ii)
LN 2 GN R325[2]	1; 6
LN 3 GN R324[3]	4(a)(i)(bb)(ee); 10(a)(i)(bb)(ee); 12(a)(ii); 14(ii)(a)(c)(a)(i)(bb)(ff); 18(a)(i)(bb)(ee) (a)(i)(bb); 23 (ii)(a)(c)(a)(bb)(ee)

Depending on the final design of the Highlands South WEF, there may be a requirement for the following additional permits/ authorisations:

- Waste Management License/s as required by the NEMA, Waste Act, 2008 (Act No. 59 of 2008);
- Mining Permits as required by the Minerals and Petroleum Resources Development Act, 2002 (MPRDA) (Act No. 28 of 2002)(MPRDA); and
- Water Use Licenses as required by the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Results of Specialist Investigations – Construction Phase Impacts

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Loss of Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Wetlands and freshwater							
Riparian systems & watercourses	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increase in sedimentation & erosion	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized water quality	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
On Vegetation	L	H	M	Negative	M	H	H

[1] "Listing Notice 1 of the EIA Regulations, promulgated under Government Notice R983 of 4 December 2014, as amended by Government Notice R327 of 7 April 2017."

[2] "Listing Notice 2 of the EIA Regulations, promulgated under Government Notice R984 of 4 December 2014, as amended by Government Notice R325 of 7 April 2017."

[3] "Listing Notice 3 of the EIA Regulations, promulgated under Government Notice R985 of 4 December 2014, as amended by Government Notice R324 of 7 April 2017."

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*L*	*M*	*M*	*Negative*	***M***	*H*	*H*
On Fauna	L	L	H	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***L***	*L*	*M*
Avifauna							
Habitat destruction	L	M	M	Negative	M	H	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Disturbance and Displacement	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Bats							
Roost disturbance	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Roost destruction	L	H	L	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Habitat modification	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Noise							
Construction of Tracks and Hardstanding	L	L	H	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Excavation and Concreting of Foundations	L	L	H	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Turbine Erection	L	L	H	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Generator (Night-time Use)	L	L	M	Negative	L	L	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Heritage and Archaeology							
On Archaeological Resources	L	H	L	Negative	M	M	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
On graves	L	H	H	Negative	M	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
On cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*H*	*H*

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Palaeontology							
On palaeontological resources	L	H	L	Negative	M	M	M
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*M*
Visual							
Visual effect on sense of place	L	L	M	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***M***	*M*	*M*
Social							
Employment and business creation opportunities	M	L	M	Positive	M	M	H
With Mitigation	*H*	*L*	*H*	*Positive*	***M***	*H*	*H*
Construction workers on local communities	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Impact of job seekers on local communities	M	L	L	Negative	L	L	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*M*
Risk to safety, livestock & farms	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increased fire risk	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
By construction vehicles	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
On farmland	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	*L*	*L*	*H*
Traffic							
Traffic Flow	M	L	M	Negative	M	M	M
With Mitigation	*M*	*L*	*M*	*Negative*	***L***	*L*	*M*
Route Constraints	M	L	H	Negative	M	H	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Minor Road Degradation	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Minor Road Dust	L	L	H	Negative	M	M	M

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Intersection Road Safety	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*

Results of Specialist Assessments – Operational Phase Impacts

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Additional land use income	L	M	L	Positive	M	H	H
With Mitigation	*L*	*M*	*L*	*Positive*	***M***	*H*	*H*
Wetlands and freshwater							
Impact on riparian systems	L	L	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Sedimentation and erosion	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized surface water quality	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
Faunal impacts	L	M	M	Negative	M	H	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil erosion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Alien plant invasion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
CBAs & Ecological Processes	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Avifauna							
Collisions with wind turbines	M	M	H	Negative	M	H	M

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*M*	*M*	*H*	*Negative*	***M***	*M*	*M*
Collisions with overhead powerlines	L	M	H	Negative	M	M	M
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*M*
Electrocution	L	M	M	Negative	M	M	M
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*H*
Disturbance and displacement	M	M	M	Negative	M	M	L
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*L*
Disruption of Local Bird Movements	M	M	M	Negative	L	L	L
With Mitigation	*M*	*M*	*M*	*Negative*	***L***	*L*	*L*
Bats							
Bat mortality during commuting / foraging	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*L*	*M*
Bat mortality during migration	H	M	M	Negative	M	L	M
With Mitigation	*M*	*M*	*M*	*Negative*	***L***	*L*	*M*
Habitat creation in high risk locations	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Light pollution	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Noise							
Noise (Day)	L	H	L	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Noise (Night)	L	H	H	Negative	H	M	H
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*M*	*H*
Heritage and Archaeology							
Cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	*M*	*H*	*H*
Visual							
Intrusion on rural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*H*
Social							

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Clean, renewable energy	M	M	M	Positive	M	M	H
With Mitigation	*M*	*H*	*M*	*Positive*	***H***	*H*	*H*
Employment and business opportunities	M	M	L	Positive	M	M	H
With Mitigation	*M*	*M*	*M*	*Positive*	***H***	*H*	*H*
Community Trust	M	H	M	Positive	M	L	H
With Mitigation	*M*	*H*	*H*	*Positive*	***H***	*H*	*H*
Income for affected farmers	M	M	L	Positive	L	L	H
With Mitigation	*M*	*M*	*M*	*Positive*	***M***	*H*	*H*
Sense of place (landscape)	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Sense of place (stakeholders)	M	M	L	Negative	L	M	M
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*M*	*M*
Property values	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Tourism in the region	M	M	L	Negative	L	L	H
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*L*	*H*
Adjacent tourism operations	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Traffic							
Route Constraints	M	L	H	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*

Results of Specialist Assessments – Decommissioning Phase Impacts

Decomm. Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Agricultural land loss	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
Faunal impacts	M	L	H	Negative	M	H	H

Decomm. Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*L*	*L*	*M*	*Negative*	***L***	*L*	*H*
Soil erosion	M	H	M	Negative	H	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Alien plant invasion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Birds							
Disturbance and Displacement	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Heritage and Archaeology							
Impacts to the cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*H*	*H*
Visual							
Potential visual intrusion	M	M	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Neutral*	***L***	*M*	*M*
Social							
Loss of jobs and income	M	M	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Traffic							
Minor Road Degradation	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Minor Road Dust	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*

Conclusion

The proposed Highlands South WEF and its associated infrastructure, as part of the proposed Highlands Wind Energy Facilities, including grid connection infrastructure, has the potential to provide much needed renewable energy to the country's grid. The use of renewable energy to provide power to South Africa is supported at International, National, Provincial and Local Government Levels. Further, given South Africa's need for additional electricity generation and the need to decrease the country's dependency on coal-based power, renewable energy has been identified as a national priority, with wind energy identified as one of the most readily available, technically viable and commercially cost-effective sources of renewable energy.

The proposed development area has been identified by the Council of Scientific and Industrial Research (CSIR) as a Renewable Energy Development Zone (REDZ) Focus Area, which has been so earmarked by the Department of Environmental Affairs (DEA) under the developing wind energy Strategic Environmental Assessment (SEA) process. The latter aims

to identify geographical areas best suited for the rollout of wind energy projects and the supporting electricity grid network. The Highlands South WEF is located within the Cookhouse REDZ, and is ideally placed to achieve the above.

The potential positive impacts associated with the proposed project are further recognised through the creation of jobs for the local community, and the positive contributions to the socio-economic development of the surrounding areas and local communities.

Should the Highlands South WEF be developed, the actual physical footprint of the wind turbines and associated on-site infrastructure will occupy an area of land equivalent to less than 1% of the total Proposed Development Site. Small livestock grazing and other agricultural activities can continue in parallel with the operation of the turbines. The project will have no significant impact in terms of loss of agricultural productivity. Should the mitigation measures identified by specialists and the recommendations of the EMPr be effectively implemented the negative impacts associated with the proposed project will be significantly reduced. The study has concluded that there are no negative high residual impacts, including potential cumulative impacts associated with the proposed development.

Taking into consideration the findings of the BA process for the proposed project and the fact that recommended mitigation measures have been used to inform the project layout design, it is the opinion of the Environmental Assessment Practitioner (EAP) that the majority of negative impacts associated with the implementation of the proposed project have been mitigated to acceptable levels. While the residual impacts of the project will have an impact on the local environment, and potentially on four to five existing game and hunting tourism operations, the extent of the benefits associated with the implementation of the projects will benefit a much larger group of people, in terms of renewable energy supply and positive local and regional economic impact. In addition, the area has been designated a Renewable Energy Development Zone for wind energy in particular, through a Strategic Environmental Impact Assessment by National Government.

ABBREVIATIONS, ACRONYMS AND UNITS

ATNS	Air Traffic and Navigation Services SOC Limited
BA	Basic Assessment
BAR	Basic Assessment Report
CARA	Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CSP	Concentrated Solar Power
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibel
DEA	Department of Environmental Affairs (National)
DEDEA	Eastern Cape Department: Economic Development Environmental Affairs, and Tourism
DMR	Department of Mineral Resources
DoE	Department Of Energy
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, 1989 No. 73 of 1989)
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Area
ESA	Early Stone Age
ESKOM	Eskom Holdings SOC Limited
EWT	Endangered Wildlife Trust
GIS	Geographical Information Systems
GNR	Government Notice Regulation
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kV	Kilovolt
kWh	Kilowatt Hours
LSA	Late Stone Age
MSA	Middle Stone Age
MW	Megawatt
NCR	Noise Control Regulations
NDP	National Development Plan
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NSD	Noise-sensitive Development
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy
PPA	Power Purchase Agreement
PPP	Public Participation Process
PV	Solar photovoltaic
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SABAAP	South African Bat Assessment Advisory Panel
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SANS	South African National Standards
SAPS	South African Police Service
SAWS	South African Weather Service
SCADA	Supervisory Control and Data Acquisition
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SIA	Social Impact Assessment
SPV	Special Project Vehicle
WEF	Wind Energy Facility
WHO	World Health Organisation
WTG	Wind Turbine Generator
WULA	Water Use License Application

DEPARTMENT OF ENVIRONMENTAL AFFAIRS INFORMATION REQUIREMENTS FOR WIND FARM APPLICATIONS

The Department of Environmental Affairs' requirements for information for all applications for Wind Energy Facilities (WEFs) is included in this section of the report. Where this information is not provided in the tables below, the location of where it can be found in the report is indicated.

Table A: DEA Information Requirements – Wind Energy Facilities General Site Information

Description				
Descriptions of all affected farm portions (Farm Portions in grey do not have a turbine position)	**Property owner**	**Farm Portion**	**Size in hectare**	**21 digit Surveyor General codes**
	ZIRK JORDAAN FAMILY TRUST	Farm 102 Rietfontein Farm 102 – Portion 0 Remaining Extent	2443.50	C06600000000010200000
	SA Government (Tenant: Simphewe & Linda Fani)	Farm 104 Coetzees Fontein Farm 104 - Portion 0	25.54	C06600000000010400000
		Farm 104 Coetzees Fontein Farm 104 - Portion 1	389.41	C06600000000010400001
		Farm 104 Coetzees Fontein Farm 104 - Portion 2	618.43	C06600000000010400002
		Farm 105 Doorn Rivier Farm 105 - Portion 0 Remaining Extent	1284.80	C06600000000010500000
		Farm 105 Doorn Rivier Farm 105 - Portion 1	1027.83	C06600000000010500001
		Farm 143 Nels Kraal Farm 143 – Portion 0	689.13	C06600000000014300000
		Farm 146 Kiepersol Farm 146 – Portion 1	125.91	C06600000000014600001
	SA Government (Tenant: Tozi Nelani)	Farm 144 Nelskom Farm 144 - Portion 0 Remaining Extent	223.91	C06600000000014400000
		Farm 145 De Mullers Kraal Farm 145 – Portion 0	865.33	C06600000000014500000
		Farm 145 De Mullers Kraal Farm 145 – Portion 8	0.88	C06600000000014500008
	HIGHLANDS TRUST	Farm 361 Highlands Farm 361 – Portion 0 Remaining Extent	1828.82	C06600000000036100000
	G K W GEBOU TRUST	Farm 103 Spaarwater Farm 103 – Portion 0	854.39	C06600000000010300000
	Jakkie Nel Trust	Farm 101 Lekker water Farm 101 – Portion 2	53.96	C06600000000010100002
		Farm 104 Coetzees Fontein Farm 104 – Portion 5	650.37	C06600000000010400005
Copies of deeds of all affected farm portions	Submitted with application form			

Description	
Photos of areas that give a visual perspective of all parts of the site	Volume II: Visual Impact Assessment Figure 2-8
Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	Volume II: Visual Impact Assessment Figure 2-8
Type of technology	Onshore Wind Turbine electricity generators
Structure height (Tip Height)	Between 125 m and 200 m
Surface area to be covered (including associated infrastructure such as roads)	Typically in wind energy facilities, the amount of surface area covered by turbines and associated infrastructure such as roads is less than 1% of the total site. Preliminary estimates using the layout provided confirm this.
Structure orientation	Conventional three bladed horizontal axis wind turbine generator mounted on a single vertical tower structure.
Laydown area dimensions (Construction period and Operation)	Permanent laydown area and the temporary construction laydown area will both be approximately up to 1 hectare each.
Generation capacity of the facility as a whole at delivery points	18 Turbines x Maximum of 5 MW per turbine = 90 MW Maximum Generation Capacity

Table B: DEA Information Requirements – WEF Technical Details

Component	Description/Dimensions
Location of the site	20 km west of Somerset East, Eastern Cape
Facility Area	The Proposed development site is approximately 10 000 hectares. This is the total area covered, in which all three phases will be located. The actual infrastructure footprint will be around 1% of this for the Highlands South WEF
Number of Turbines	Up to 18
Site Access	-32.802450/25.388478 -32.689127/25.358599

Component	Description/Dimensions
up to	up to 135 m
Blade Length	up to 75 m
Rotor Diameter	up to 150 m
Area occupied by inverter transformer stations/substations	1.1 hectares
Capacity of on-site substation	66/132 kV
Area occupied by both permanent and construction laydown areas	1 hectare permanent laydown area 1 hectare construction laydown area
Operations and maintenance buildings (O&M building) with parking area	200 m x 200 m
Length of internal roads	approximately 50 km
Width of internal roads	12 m (6 m wide road surface plus 3 m on each side for road reserve and drainage)
Proximity to grid connection	On the northern part of the site, where existing 132 kV and 66 kV overhead powerlines are located. . The WEF will connect into existing Eskom transmission lines located within the proposed development site.
Height of fencing	Up to 3 metres high
Type of fencing	Stock proof palisade / diamond mesh

Table C: DEA Information Requirements - Site Maps and GIS Information

Site Maps and GIS Information	Section of this Report
All maps/information layers are provided in ESRI Shapefile format.	
All affected farm portions must be indicated.	Figure 7.2 Highlands South WEF Development Plan
The exact site of the application must be indicated (the areas that will be occupied by the application).	Figure 1.1 Site Location Figure 7.1 Highlands WEFs Development Plan Figure 7.2 Highlands South WEF Development Plan
A *status quo* map/layer must be provided that includes the following: Current use of land on the site including:	
Buildings and other structures	Figure 8.3 Land Use
Agricultural fields	Figure 8.2 Land Types and Agricultural Sensitivity
Grazing areas	Figure 8.3 Land Use

Site Maps and GIS Information	Section of this Report
Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas	Figure 8.3 Land Use Figure 10.1 Vegetation Types Figure 10.2 Critical Biodiversity Areas
Critically endangered and endangered vegetation areas that occur on the site	Figure 10.3 Ecological Sensitivity
Bare areas which may be susceptible to soil erosion	No specific bare areas have been identified. During construction phase, vegetation removal will be confined to the smallest possible footprint, runoff will be controlled and site-specific measures will be devised for any potentially high risk areas.
Cultural historical sites and elements	Figure 20.1 Environmental Sensitivity
Rivers, streams and water courses	Figure 9.4 Watercourses
Ridgelines and 20 m continuous contours with height references in the GIS database	Figure 8.1 Slope Analysis Map
Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs	Figure 9.4 Watercourses within and adjacent to study area
High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries	Figure 8.2 Land types and agricultural sensitivity Figure 8.3 Land Use
Buffer zones (also where it is dictated by elements outside the site): **500 m from any irrigated agricultural land** **1 km from residential areas**	Figure 8.2 Land types and Agricultural Sensitivity Figure 8.3 Land Use Figure 20.1 Environmental Sensitivity
Indicate isolated residential, tourism facilities on or within 1 km of the site	Figure 8.2 Land Use Figure 13.1 Noise Sensitive Developments Figure 15.3 Protected Environments, Cultural Landscapes, Farmsteads with Buffers
A slope analysis map/layer that include the following slope ranges: **Less than 8% slope (preferred areas for turbines and infrastructure)** **Between 8% and 12% slope (potentially sensitive to turbines and infrastructure) Between 12%and 14% slope (highly sensitive to turbines and infrastructure)** **Steeper than 18% slope (unsuitable for turbines and infrastructure)**	Figure 8.1 Slope Analysis Map

Site Maps and GIS Information	Section of this Report
A map/layer that indicate locations of birds and bats including roosting and foraging areas	Figure 11.1 Avifaunal Sensitivity Figure 12.1 Bat Sensitivity
A site development proposal map(s)/layer(s) that indicate: **Turbine positions** **Foundation footprint** **Permanent laydown area footprint** **Construction period laydown footprint** **Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible).**	Figure 7.2 Highlands South WEF Development Plan
River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used.	Figure 7.2 Highlands South WEF Development Plan
Substation(s) and/or transformer(s) sites including their entire footprint.	Figure 7.2 Highlands South WEF Development Plan
Cable routes and trench dimensions (where they are not along internal roads) Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM).	Figure 7.2 Highlands South WEF Development Plan
Cut and fill areas at turbine sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill	Location of turbine foundations, substation, hardstanding and laydown areas have been chosen on flat positions as much as possible (Figure 7.2 Highlands South WEF Development Plan), to minimise cut and fill required. Volumes to be determined prior to construction.
Borrow pits	No borrow pits on site. Licenced borrow pits will be used to source material.
Spoil heaps (temporary for topsoil and subsoil and permanently for excess material) Buildings including accommodation	Temporary and permanent spoil heaps will be kept within demarcated construction areas, and monitored by the ECO during the construction phase.

TABLE OF CONTENTS

Figure List

1 INTRODUCTION

WKN Windcurrent South Africa (Ltd) Pty ('the Developer') is proposing the Highlands Wind Energy Facilities (WEFs), and associated infrastructure including grid connection infrastructure (the Proposed Development), located 20 km from the town of Somerset East in the Eastern Cape Province. The area of interest for development within the affected land parcels is approximately 9000 hectares (The Proposed Development Area), and falls entirely within the Cookhouse Renewable Energy Development Zone (REDZ) (Figure 1.1). The Proposed Development aims to generate and produce electricity from renewable wind energy sources in order to supply electricity into the national grid by connecting to an existing Eskom transmission line within the Proposed Development Area.

Arcus Consultancy Services South Africa (Ltd) Pty ('Arcus') has been appointed to act as the independent environmental impact assessment practitioner (EAP) to undertake the environmental impact assessment (EIA) process for Environmental Authorisation under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998 – NEMA) as amended, for the Proposed Development.

For the purpose of obtaining Environmental Authorisation (EA), and bidding requirements in the Department of Energy's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), the project has been split into three phases: North, Central and South. A Special Purpose Vehicle (SPV) has been set up for each of the three phases. Each phase will consist of two applications: one for the wind energy facility and one for the respective grid connection. The proposed Development therefore consists of six components and six separate applications for EA:

Highlands North Wind Energy Facility (RF) (PTY) Ltd:

- The Highlands North WEF (up to 85 MW) consisting of up to 17 turbines with a generating capacity of up to 5 MW each;
- Electrical Grid Connection and Associated Infrastructure for Highlands North WEF;

Highlands Central Wind Energy Facility (RF) (PTY) Ltd:

- The Highlands Central WEF (up to 70 MW) : up to 14 turbines with a generating capacity of up to 5 MW each
- Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF;

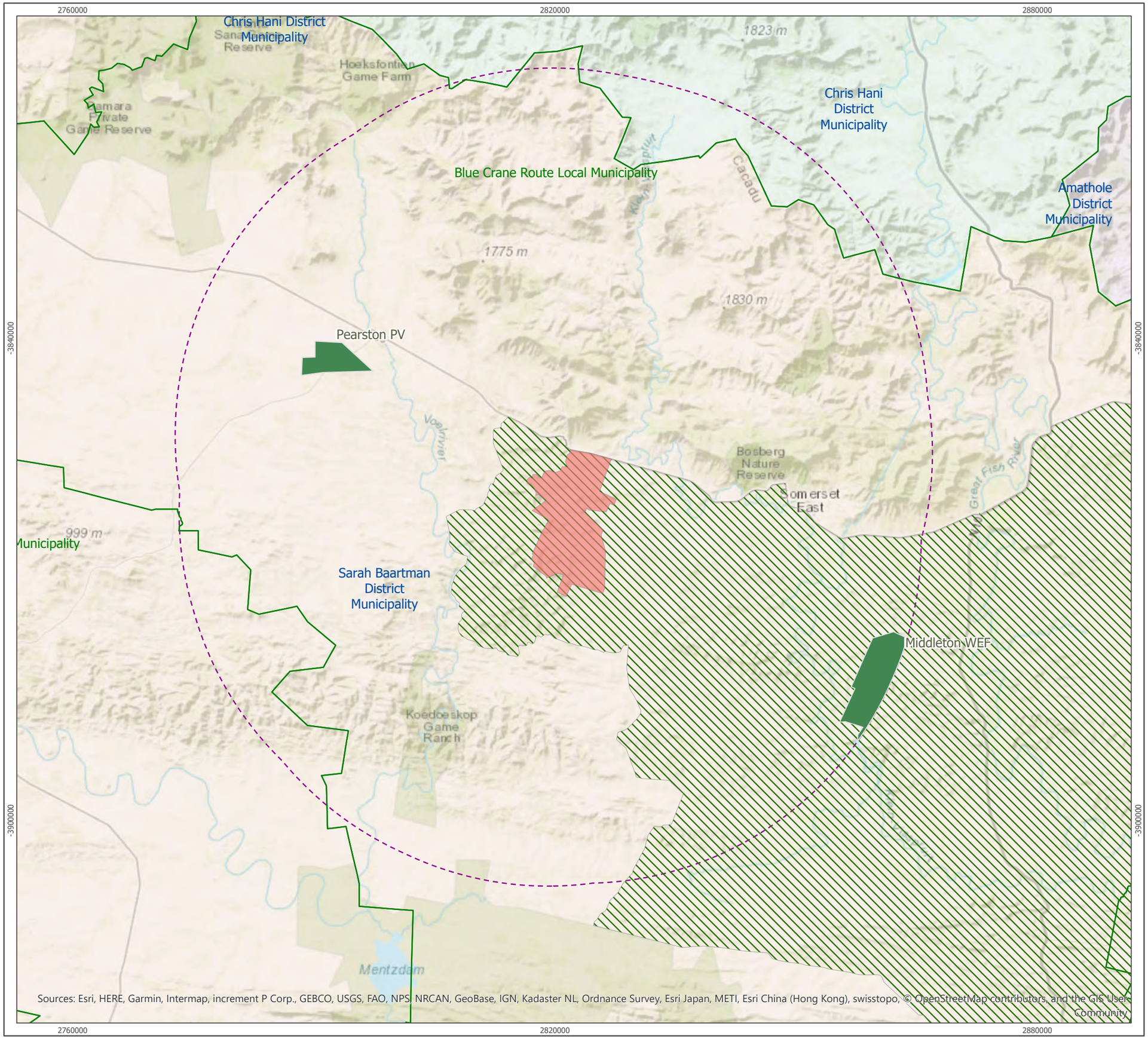
Highlands South Wind Energy Facility (RF) (PTY) Ltd:

- **The Highlands South WEF (up to 90 MW): up to 18 turbines with a generating capacity of up to 5 MW each;**
- Electrical Grid Connection and Associated Infrastructure for Highlands South WEF.

This report pertains to the **Highlands South WEF (up to 90 MW)** consisting of up to 18 turbines with a generating capacity of up to 5 MW each (The Proposed Project).

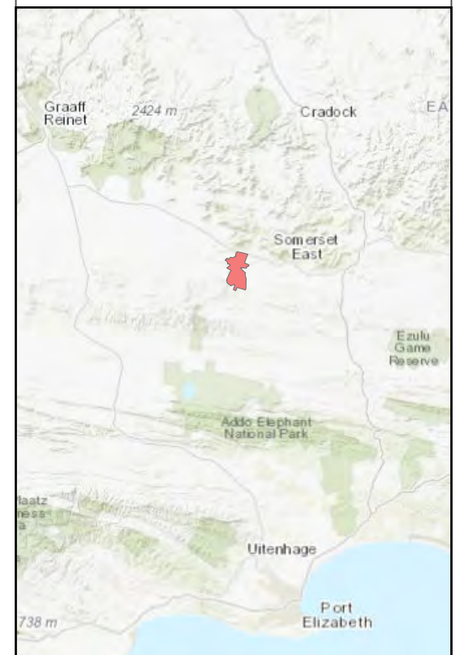
Should the Proposed Development be bid in the REIPPPP two submissions will be made: The Highlands South WEF will be combined with the Highlands Central WEF or be bid on its own, with the Highlands Central WEF being combined with Highlands North WEF. Due to these uncertainties the specialist studies have described the baseline environment of the entire Proposed Development Site as the affected environment. The impact assessments however assess the Proposed Project individually, as well as cumulatively.

On 16 February 2018, the Minister of Environmental Affairs promulgated new regulations in terms of Chapter 5 of the NEMA, Government Notices (GN) No. R. 114 in Government Gazette No. 41445 of 16 February 2018. These state that applications for environmental authorisation for large scale wind energy facilities, when such facilities trigger activity 1 of



ARCUS

- Proposed Development Area
- DEA Renewable Energy Applications 2018 Q2
- Renewable Energy Development Zone (REDZ)
- Local Municipality Boundary
- 35 km Radius
- Amathole District Municipality
- Chris Hani District Municipality
- Sarah Baartman District Municipality



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

1:455,962 Scale @ A3

0 10 20 km

NORTH

Produced By: AA	Ref: 2780-REP-008
Checked By: SC	Date: 04/09/2018

Site Location
Figure 1.1

Highlands South WEF
Basic Assessment Report

Z:\GIS\Projects\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\South WEF Fig 1.1 Site Location

GN No.325 (Listing Notice 2), and where the entire proposed facility is to occur in a REDZ must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the EIA Regulations 2014, as amended, in order to obtain environmental authorisations, as required, in terms of the Act. Further, the timeframe for decision-making as contained in the EIA Regulations, 2014, as amended, for the purposes of the applications for environmental authorisation is 57 days.

Therefore, a Basic Assessment (BA) process will be followed for the application for environmental authorisation for the Highlands South WEF.

1.1 Purpose and Structure of this Report

The purpose of this Basic Assessment (BA) Report is to present the environmental impact assessment process undertaken on the preferred alternative for the proposed development. The preferred site, layout, and technical specifications were assessed by the specialists and their findings and assessment are collated in this BA report. This BA report will provide sufficient information for the competent authority to make an informed decision on the proposed development. The report further addresses comment received during the public participation process.

The BA Report is set out in three volumes:

Volume I: BA Report

Volume II: Specialist Reports

Volume III: Comment & Response Report

Table 1.4: Structure of this Report

Section	Title	Containing
1	Introduction	Purpose and Structure of the BA Report; Overview of the BA Process; the Applicant; The EAP; The Specialists; Assumptions and Limitations
2	Environmental Legal Framework	National Environmental Legislation, Additional relevant legislation, International Conventions and Treaties, Policies and Guidelines.
3	Methodology	Feasibility Assessment; Specialist study assessments; Assessment technique for the BA; Cumulative Impact Assessment
4	Public Participation	Key Stakeholders; Initial Notifications; BA Process Public Participation; Summary of Issues Raised
5	Need and Desirability	Description of the Need and Desirability of the Proposed Development.
6	Assessment of Alternatives	A Comparative Analysis of Site, Technology, Location, Design and the No-Go Alternatives.
7	The Preferred Alternative	Description of the Proposed Project
8	Geology, Soils and Agriculture	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
9	Freshwater and Wetlands	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion

Section	Title	Containing
10	Flora and Terrestrial Fauna	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
11	Avifauna	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
12	Bats	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
13	Noise	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
14	Heritage, Archaeology and Palaeontology	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
15	Visual	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
16	Social	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
17	Traffic and Transportation	Baseline Description of the affected Environment; Description and Assessment of Potential Impacts; Conclusion
18	Cumulative Impacts	Specialists assessments of cumulative impacts with a minimum of 35 km from the site
19	Summary of Findings	A summary of the Specialists Impact Assessments
20	Impact Statement	The EAPs Impact Statement and Conditions to be included in the EA
Appendix A	EAP Declaration of Independence and CV	Commissioner of Oaths and CV pf the Lead EAP
Appendix B	Environmental Management Programme	The Environmental Management Programme, detailing the Proposed Mitigation Measures, and the Roles and Responsibility of Management during the Construction, Operation and Decommissioning of the Proposed Development.

1.2 Overview of the Basic Assessment Process

A Basic Assessment (BA) process is ultimately a decision-making process with the specific aim of selecting a development option that will provide the most benefit, and cause the least environmental impact. The BA process assesses the potential impact of the identified activities which may have a detrimental effect on the environment, and which would therefore require Environmental Authorisation prior to commencement.

An independent Environmental Assessment Practitioner (EAP) and specific specialists identify potential negative and positive impacts that could arise as a result of the proposed

project and mitigation measures are recommended which would allow for the avoidance or reduction of negative impacts or which may enhance positive impacts.

The key phases of this BA process are described below:

- **Initial Notification and Call to Register as I&APs through the following:** Advertisements, site notices, posters, letters to landowners and pre-identified I&APs. The aim of this step is to inform people of the proposed activity and to encourage initial comment and feedback.
- **Basic Assessment Process: Collation of initial comments and specialist investigations into a concise report (this document) which provides feedback on the following:**
  - Nature of the activity;
  - Description of the receiving environment;
  - Identification of potential feasible alternatives;
  - Identification of potential positive and negative impacts; and
  - Identification of knowledge gaps.

This Basic Assessment process has involved an initial feasibility investigation by the specialists of the Proposed Development Site, which identified areas suitable for development as well as environmental constraints, which fed into the design of the proposed facility layout for assessment. The results of these assessments further informed the Final Mitigated Layout submitted for approval.

The identified impacts have been assessed and relevant management and mitigation measures have been included in an Environmental Management Programme (EMPr). The findings are included in this Report.

- **Ongoing Public Consultation:** Throughout the process, registered I&APs are consulted. This involvement was initiated through the dissemination of information by means of advertisements, notification letters, posters and site notices. Opportunities are provided for Interested and Affected Parties (I&APs) to review and comment on the Draft and Final Basic Assessment Reports.

Following the completion of the relevant processes described above and the submission of documentation to the competent authority (DEA), the DEA will review the application and issue a decision (Environmental Authorisation). I&APs will be informed of the decision and their rights to appeal.

1.3 The Developer

WKN-Windcurrent South Africa (Pty) Ltd (WKn-WC) is a South African registered company dedicated to the development of wind energy projects to supply energy to the national grid.

In accordance with the REIPPP bid requirements WKN-WC has established Highlands South Wind Energy Facility (RF) (Pty) Ltd as a Special Purpose Vehicle (SPV) that will be used to own all the authorisations, contracts, permits and licenses required to lawfully build and operate the proposed Highlands South Wind Energy Facility.

1.4 The Environmental Assessment Practitioner

The co-ordination and management of this EIA process is being conducted by Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') with the lead EAP being Ashlin Bodasing. Refer to Appendix A for the EAP's Declaration of Interest and *Curriculum Vita*.

Ashlin Bodasing

Qualifications	Bachelor of Social Science (Geography and Environmental Management)
Experience in Years	13 years
Experience	Ashlin Bodasing is the Technical Director at Arcus, located in Cape Town. Having obtained her Bachelor of Social Science Degree from the University of Kwa-Zulu Natal; she has over 13 years' experience in the environmental consulting industry in southern Africa. She has gained extensive experience in the field of Integrated Environmental Management, environmental impact assessments and public participation. She has also been actively involved in a number of industrial and infrastructural projects, including electricity power lines and substations; road and water infrastructure upgrades and the installation of telecommunication equipment and as well green field coal mines, as well as renewable energy facilities, both wind and solar. Ashlin has major project experience in the development of Environmental Impact Assessments, Environmental Management Plans and the monitoring of construction activities. Her areas of expertise include project management, environmental scoping and impact assessments, environmental management plans, environmental compliance monitoring and environmental feasibility studies. Experience also includes International Finance Corporation Performance Standards and World Bank Environmental Guidelines environmental reviews. She has worked in Mozambique, Botswana, Lesotho and Zimbabwe.

Anja Albertyn

Qualifications	Master of Science (Zoology)
Experience in Years	9 years
Experience	Anja Albertyn has worked at Arcus since November 2013. She is registered with SACNASP as a professional natural scientist in the field of ecological science. She has worked as a consultant since February 2009, when she oversaw a large-scale ballast water treatment testing project for an environmental consultancy in Cape Town for over two years. Since then she has worked on over 22 renewable energy development projects. Anja is involved in all aspects of environmental impact assessments, avifaunal specialist studies, and also functions as Arcus' GIS specialist in Cape Town. She holds a Master of Science in Zoology (Ornithology) from the Percy FitzPatrick Institute of African Ornithology at the University of Cape Town. She is currently in the position of Avifauna Specialist and Environmental Assessment Practitioner.

Arcus is a specialist environmental consultancy providing environmental services to the renewable energy market. Arcus has advised on over 150 renewable energy projects in the United Kingdom and South Africa, with environmental management and in-house specialist services.

1.5 The Specialists

The EAPs have assembled a team of technical specialists to undertake studies for the proposed Highlands Wind Energy Facilities.

The specialists' fields of investigation are listed in below. The areas of investigation have been identified as relevant to the proposed development as per the experience of the EAP, consultation with the listed specialists who are familiar with the locality and nature of development.

These specialists have been selected based on their experience in their specialist field, of renewable energy developments and the locality of the proposed development.

Name	Organisation	Role
Andrew Pearson	Arcus Consultancy Services	Bird Impact Assessment and Monitoring
Jon Smallie	Wildskies	External review of Bird IA

Name	Organisation	Role
Jonathan Aronson	Arcus Consultancy Services	Bat Impact Assessment and Monitoring
Stephanie Dippenaar	Bird & Bats Unlimited	External review of Bat IA
Michael Reid	Arcus Consultancy Services	Noise Impact Assessment
Morné de Jager	Enviro Acoustics Research	External reviewer of Noise IA
Simon Todd	3 Foxes Consulting	Terrestrial Ecological Impact Assessment (Flora and Fauna)
Dr Jayson Orton	ASHA Consulting	Cultural Heritage and Archaeology Impact Assessment
Dr John Almond	via ASHA Consulting	Palaeontology Impact Assessment
Dr Brian Colloty	Scherman Colloty and Associates	Freshwater and Wetlands Impact Assessment
Quinton Lawson & Bernard Oberholzer	Quinton Lawson & Bernard Oberholzer Architects	Landscape and Visual Impact Assessment
Johann Lanz	Johann Lanz Soil Scientist	Geology, Soils and Agriculture Impact Assessment
Tony Barbour	Tony Barbour Environmental Consulting and Research	Socio-Economic Impact Assessment
Stephen Fautley	TechSO	Traffic Impact Assessment

1.6 Assumptions and Limitations

The following assumptions and limitations are applicable to this study:

- It is assumed that the site investigated and assessed for the proposed WEF is technically suitable for such development.
- It is assumed that the connection to the national grid via the existing Eskom's Transmission Line is technically adequate, feasible and viable.
- Power generation alternatives were not investigated due to the fact that this application is project specific i.e. electricity generation from wind resources.
- The assumption is made that the information on which this report is based (specialist studies and project information, as well as existing information) is accurate and correct at the time of writing this report.
- It is assumed that the recommendations derived from this study would be included in all tender documentation and the EMP for implementation.
- This study does not analyse the impact of borrow pits. Contractors would be expected to provide services with all necessary approvals in place.

The assumptions and limitations of each specialist study presented in Volume II of this report, are noted for this BA Report.

2 ENVIRONMENTAL LEGAL FRAMEWORK

2.1 The National Environment Management Act, 1998 (Act No 107 of 1998)

Section 2 of the National Environment Management Act, 1998 (NEMA) as amended, lists environmental principles that are to be applied by all organs of state regarding proposals that may significantly affect the environment. Included amongst the key principles is the principle that all development must be socially, economically and environmentally sustainable, environmental management must place people and their needs at the forefront of its concern, to serve their physical, psychological, developmental, cultural and social interests equitably.

NEMA also provides for the participation of I&APs and it stipulates that decisions must take the interests, needs and values of all I&APs into account.

Chapter 5 of NEMA outlines the general objectives and implementation of Integrated Environmental Management (IEM), the latter providing a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 provides a framework for the granting of environmental authorisations.

In order to give effect to the general objectives of IEM, the potential impacts on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority. Section 24(4) outlines the minimum requirements for procedures for the investigation, assessment and communication of the potential impact of activities.

On 7 April 2017 the Minister of Environmental Affairs published amendments to the NEMA: EIA Regulations of 2014 (GNR 326) and the three Listing Notices (GNR 324, 325 and 327) in Government Gazette No. 40772. This amendment was promulgated under the NEMA: EIA Regulations 2014 published by the Minister of Environmental Affairs in Government Gazette No. 38282 on 8 December 2014. The 2014 EIA Regulations in turn were promulgated under the requirements of Chapter 5 of the NEMA.

The EIA Regulations 2014 as amended by GNR 326 of 2017 provide for the control of certain Listed Activities. These activities are listed in Government Notice No. R327 (Listing Notice 1 – Basic Assessment), R325 (Listing Notice 2 – Scoping & EIA Process) and R324 (Listing Notice 3 – Basic Assessment) of 7 April 2017, and are prohibited to commence until environmental authorisation has been obtained from the competent authority, in this case, the Department of Environmental Affairs (DEA).

The DEA is the competent authority for all renewable energy proposals, as NEMA states that:

"24C. (2) The Minister must be identified as the competent authority in terms of subsection (1) if the activity- (a) has implications for international environmental commitments or Relations; ….(c) has a development footprint that falls within the boundaries of more than one province or traverses international boundaries."

This project has implications for international environmental commitments that South Africa has made in terms of climate change.

Environmental authorisation, which may be granted subject to conditions, will only be considered upon compliance with GNR982, as amended by GNR326 of 7 April 2017.

On 16 February 2018, the Minister of Environmental Affairs promulgated new regulations in terms of Chapter 5 of the NEMA, Government Notices (GN) No. R. 114 in Government Gazette No. 41445 of 16 February 2018. These state that applications for environmental authorisation for large scale wind energy facilities, when such facilities trigger activity 1 of GN No.325 (Listing Notice 2), and where the entire proposed facility is to occur in a REDZ must follow the basic assessment procedure contemplated in Regulation 19 and 20 of the EIA Regulations 2014, as amended, in order to obtain environmental authorisations, as required, in terms of the Act. Further, the timeframe for decision-making as contained in the EIA Regulations, 2014, as amended, for the purposes of the applications for environmental authorisation is 57 days.

Therefore a Basic Assessment process is to be followed for this application (and the related applications).

Any Environmental Authorisation obtained from the DEA applies only to those specific listed activities for which the application was made. To ensure that all Listed Activities that could potentially be applicable to this proposal are covered by the Environmental Authorisation,

a precautionary approach is followed when identifying listed activities, that is, if an activity could potentially be part of the proposed development, it is listed.

The Listed Activities applicable to this proposed project are presented in Table 2.1 below. All potential impacts associated with these Listed Activities will be considered and adequately assessed in this BA process.

Table 2.1: NEMA Listed Activities in Relation to the Proposed Development

Listing Notices 1 - 3 07 April 2017	***Listed Activity***	***Description of project activity that triggers listed activity***
Listing Notice 1 GN R 327 Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	Medium voltage powerlines will be installed to transfer electricity from the turbines to an on-site substation. Cables will be installed underground where feasible.
Listing Notice 1 GN R 327 Activity 12	*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 (c) if no development setback exists within 32 m of a watercourse, measured from the edge of a watercourse*	Infrastructure may be required at water-crossings that covers an area of more than 100 m^2.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the WEF would likely include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and in some instances may exceed 10 cubic metres. Borrow pits for the sourcing of aggregate material may be required. Figure 7.2 shows the location of water crossings. The construction of associated infrastructure, such as access tracks crossing watercourses may require excavation and/or infilling of watercourse areas.
Listing Notice 1 GN R 327 Activity 24	*The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Access roads of 6 - 12 m will be required between turbines.
Listing Notice 1 GN R 327 Activity 27	*The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation*	The infrastructure and building area of the proposed WEF may require clearing of at least 1 hectare of indigenous vegetation in total.
Listing Notice 1 GN R 327 Activity 48	*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;*	Existing bridges over watercourses may need to be expanded or widened.
Listing Notice 1 GN R 327 Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (ii) where no reserve exists, where the existing road is wider than 8 metres;*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and may be wider than 8 m in some areas.

Listing Notices 1 - 3 07 April 2017	***Listed Activity***	***Description of project activity that triggers listed activity***
	excluding where widening or lengthening occur inside urban areas.	
Listing Notice 2 GN R 325 Activity 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.*	The WEF will consist of up to 18 turbines for electricity generation with a combined capacity of more than 20 MW.
Listing Notice 2 GN R 325 Activity 6	*The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.*	The construction of the WEF will require a Water Use License in terms of the National Water Act, 1998 (Act No. 36 of 1998).
Listing Notice 3 GN R 324 Activity 4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and parts of the site fall with a NPAESF and a Tier 2 CBA.
Listing Notice 3 GN R324 Activity 10	*The development and related operation 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.* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Fuel storage during construction is likely to exceed 30 m^3. The proposed on-site substation is likely to require the use of transformer oils/other hazardous substances during the operational phase.
Listing Notice 3 GN R324 Activity 12	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *a. Eastern Cape* *ii. Within critical biodiversity areas identified in bioregional plans;*	The proposed development will require the clearance of natural vegetation in excess of 300 m^2 in areas of natural vegetation. Parts of the site fall within a Tier 2 Critical Biodiversity Area.
Listing Notice 3 GN R324 Activity 14	*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;* *(c) if no development setback has*	Bridges and infrastructure may be constructed within 32 m of watercourse(s). The site lies outside of an urban area and a portion of the site falls with an NPAESF area and a Tier 2 Critical Biodiversity Area.

Listing Notices 1 - 3 07 April 2017	*Listed Activity*	*Description of project activity that triggers listed activity*
	been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; *a. Eastern 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;*	
Listing Notice 3 GN R324 Activity 18	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Existing farm roads may need to be widened or lengthened. The site lies outside urban areas, and a portion of the site falls with an NPAESF area and a Tier 2 Critical Biodiversity Area.
Listing Notice 3 GN R324 Activity 23	*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;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *a. Eastern Cape* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	The construction of the WEF may include the expansion of existing bridges over watercourses. The site lies outside of any urban area, and parts of the site fall within a Critical Biodiversity Area.

2.2 The National Heritage Resources Act, 1999 (Act No 25 of 1999)

Section 38 (1) of the National Heritage Resources Act, 1999 (NHRA) lists development activities that would require authorisation by the responsible heritage resources authority. Activities considered applicable to the proposed project include the following:

"*(a) The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*
(c) any development or other activity which will change the character of a site; and
(i) exceeding 5000 m² in extent."

The NHRA requires that a person intending to undertake such an activity must notify the relevant national and provincial heritage authorities at the earliest stages of initiating such a development.

The relevant heritage authority would then in turn, notify the person whether a Heritage Impact Assessment Report should be submitted. According to Section 38(8) of the NHRA, a separate report would not be necessary if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (No. 73 of 1989) (ECA) (now replaced by NEMA) or any other applicable legislation. The decision-making authority must ensure that the heritage evaluation fulfils the requirements of the NHRA and take into account any comments and recommendations made by the relevant heritage resources authority. As such, a Heritage Impact Assessment (HIA) will form part of this Basic Assessment process.

In South Africa, the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The NHRA also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage, which must be considered in any heritage assessment, includes:

- *Any place of cultural significance (described below);*
- *Buildings and structures (greater than 60 years of age);*
- *Archaeological sites (greater than 100 years of age);*
- *Palaeontological sites and specimens;*
- *Shipwrecks and aircraft wrecks; and*
- *Graves and grave yards.*

Section 3(3) of the NHRA defines the cultural significance of a place or objects with regard to the following criteria:

a. *Its importance in the community or pattern of South Africa's history;*
b. *Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;*
c. *Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;*
d. *Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;*
e. *Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;*
f. *Its importance in demonstrating a high degree of creative or technical achievement at a particular period;*
g. *Its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;*
h. *Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and*
i. *sites of significance relating to the history of slavery in South Africa.*

While not specifically mentioned in the NHRA, Scenic Routes are recognised as a category of heritage resources which requires grading as the Act protects area of aesthetic significance (clause "e" above).

The heritage impact assessment reports have been submitted to the SAHRA for comment.

2.3 Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970)

In terms of the Subdivision of Agricultural Land Act, 1970, any application for change of land use must be approved by the Minister of Agriculture.

2.4 Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA), 1983 states that no degradation of natural land is permitted. The Act requires the protection of land against soil erosion and

the prevention of water logging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

2.5 The Environment Conservation Act, 1989 (Act No.73 of 1989), the National Noise Control Regulations: GN R154 of 1992

The Environment Conservation Act, 1989 (ECA) allows the Minister of Environmental Affairs and Tourism ("now the Minister of Environmental Affairs") to make regulations regarding noise, amongst other concerns. The Minister has made noise control regulations under the ECA.

In terms of section 25 of the ECA, the national noise-control regulations (NCR) were promulgated (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992). The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the NCR was devolved to provincial and local authorities.

These regulations define "**disturbing noise**" as:

"*Noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more*".

These Regulations prohibits anyone from causing a disturbing noise.

No provincial noise control regulations have been promulgated in the Eastern Cape Province and thus the National Noise Control Regulations are relevant here.

2.6 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

Section 34 of the Air Quality Act, 2004 (AQA) makes provision for:

(1) The Minister to prescribe essential national noise standards -
- (a)For the control of noise, either in general or by specified machinery or activities or in specified places or areas; or
- (b)For determining –
  - (i) a definition of noise; and
  - (ii) The maximum levels of noise.

(2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards.

This section of the Act is in force, but no such standards have yet been promulgated.

An atmospheric emission license issued in terms of Section 22 may contain conditions in respect of noise. This however will not be relevant to the WEF.

2.6.1 National Dust Control Regulations, 2013

The National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004), makes provision for national dust control regulations. These regulations prescribe dust fall standards for residential and non-residential areas. These Regulations also provide for dust monitoring, control and reporting.

The acceptable dust fall out rates are:

Restriction Area	Dust Fall (D) (mg/m^2/day, 30 day average)	Permitted Frequency of exceedance
Residential	D<600	Two within a year, not sequential months
Non- Residential	600 <D< 1200	Two within a year, not sequential months

2.7 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (NWA) provides for constitutional requirements including pollution prevention, ecological and resource conservation and sustainable utilisation. In terms of this Act, all water resources are the property of the State.

A water resource includes any watercourse, surface water, estuary or aquifer, and, where relevant, its bed and banks. A watercourse is interpreted as a river or spring; a natural channel in which water flows regularly or intermittently; a wetland lake or dam into which or from which water flows; and any collection of water that the Minister may declare to be a watercourse.

Relevant water uses for the proposed construction of the Highlands South WEF, which will require access roads over watercourses and drainage channels, in terms of Section 21 of the Act include, but are not limited to, the following:

Section 21(c): Impeding or diverting the flow of water in a watercourse; and
Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

GN 1199 of 18 December 2009 grants general authorisation for the above water uses based on certain conditions. It is also stipulates that these water uses must be registered with the responsible authority.

Pollution of river water is a contravention of the NWA. Chapter 3, Part 4 of the NWA deals with pollution prevention and in particular the situation where pollution of a water resource occurs or might occur as a result of activities on land. The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources.

Chapter 3, Part 5 of the NWA deals with pollution of water resources following an emergency incident, such as an accident involving the spilling of a harmful substance that finds or may find its way into a water resource. The responsibility for remedying the situation rests with the person responsible for the incident or the substance involved.

The aquatic assessment has determined that there will be 9 water crossings. Highlands South WEF (RF) (Pty) Ltd is applying for a Water Use License, and proof of the application process will be provided to the DEA with the Final Basic Assessment Report.

2.8 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) – Threatened or Protected Species List

Amendments to the Threatened or Protected Species (TOPS) list were published on 31 March 2015 in Government Gazette No. 38600 and Notice 256 of 2015. Certain bird species that occur on the site may be threatened or protected.

2.8.1 Alien and Invasive Species Regulations, 2014

The Act and Regulations set out various degrees of Invasive species (Plants, Insects, Birds, Animals, Fish and Water Plants) and requires that certain of those invasive species are

documented and, in some cases, removed from properties in South Africa. This must happen before a property may be sold.

The Regulations list 4 categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa.

2.9 Cape Nature and Environmental Conservation Ordinance No. 19 of 1974; and Nature and Environmental Conservation Regulations (1975)

These were developed to protect both animal and plant species within the Western Cape and Eastern Cape Province (excluding the former Ciskei and Transkei) and parts of the North West province (excluding the former Boputhatswana) which warrant protection. These may be species which are under threat or which are already considered to be endangered and species are listed in the relevant documents. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation.

2.10 Additional Relevant Legislation

The applicant must also comply with the provisions of other relevant national legislation. Additional relevant legislation that has informed the scope and content of this BA Report includes the following:

- *Constitution of the Republic of South Africa, 1996 (Act No. 108, 1996);*
- *Aviation Act, 1962 (Act No. 74, 1962);*
- *National Environmental Management: Waste Act, 2008 (Act No. 59, 2008);*
- *National Forest Act, 1998 (Act No. 84, 1998);*
- *National Environmental Management: Protected Areas Act, 2003(Act No. 57, 2003);*
- *National Roads Act, 1998 (Act No. 7, 1998)*
- *Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);*
- *National Veld and Forest Fire Bill of 10 July 1998;*
- *Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947;*
- *Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007);*
- *Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); and*
- *Independent Communications Authority of South Africa Act, 2000 (Act No. 13 of 2000; as amended).*

2.11 Conventions and Treaties

2.11.1 The Convention on Biological Diversity (CBD) (1993)

This is a multilateral treaty for the international conservation of biodiversity, the sustainable use of its components and fair and equitable sharing of benefits arising from natural resources. Signatories have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

The convention prescribes that signatories identify components of biological diversity important for conservation and monitor these components in light of any activities that have been identified which are likely to have adverse impacts on biodiversity. The CBD is based on the precautionary principle which states that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat and that in the absence of scientific consensus the burden of proof that the action or policy is not harmful falls on those proposing or taking the action.

2.11.2 The Ramsar Convention (1971)

The Convention on Wetlands, called the Ramsar Convention, as it was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975, is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Under the three pillars of the convention the Contracting Parties commit to work towards the wise use of all their wetlands through national plans, policies and legislation, management actions and public education; designate suitable wetlands for their list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management; and Cooperate internationally on transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

2.11.3 The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) (1983)

An intergovernmental treaty, concluded under the sponsorship of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. The fundamental principles listed in Article II of this treaty state that signatories acknowledge the importance of migratory species being conserved and agree to take action to this end "*whenever possible and appropriate*", "*paying special attention to migratory species the conservation status of which is unfavourable and taking individually or in cooperation appropriate and necessary steps to conserve such species and their habitat*".

2.11.4 The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (1999)

An intergovernmental treaty developed under the framework of the Convention on Migratory Species (CMS), concerned with the coordinated conservation and management of migratory waterbirds throughout their entire migratory range. Signatories of the Agreement have expressed their commitment to work towards the conservation and sustainable management of migratory waterbirds, paying special attention to endangered species as well as to those with an unfavourable conservation status. The assessment of the ecology and identification of sites and habitats for migratory waterbirds is required to coordinate efforts that ensure that networks of suitable habitats are maintained and investigate problems likely posed by human activities.

2.12 Policies and Guidelines

2.12.1 Environmental Impact Assessment Guidelines

Relevant guidelines and policies as applicable to the management of the EIA process and to this application have also been taken into account, as indicated below:

- IEM Guideline Series (Series 3): Stakeholder engagement (2002);
- IEM Guideline Series (Series 4): Specialist studies (2002);
- IEM Guideline Series (Series 5): Impact Significance (2002);
- IEM Guideline Series (Guideline 5): Companion to the EIA Regulations 2010 (October 2012);
- IEM Guideline Series (Series 7): Cumulative Effects Assessment (2002);
- IEM Guideline Series (Guideline 7): Public Participation in the EIA process (October 2012);
- IEM Guideline Series (Series 7): Alternatives in the EIA process (2002);
- IEM Guideline Series (Guideline 9): Draft guideline on need and desirability in terms of the EIA Regulations 2010 (October 2012);

- DEA (2017) Guideline on Need and Desirability, Department of Environmental Affairs (DEA) Pretoria, South Africa;
- IEM Guideline Series (Series 12): Environmental Management Plans (EMP) (2002); and
- IEM Guideline Series (Series 15): Environmental impact reporting (2002).

2.12.2 Noise Standards

2.12.2.1 SANS 10328

SANS 10328 defines procedures for environmental noise impact investigations and assessments at the various stages of an Environmental Impact Assessment.

According to the standard, there could be acoustical implications where a wind generator farm is to be established within 2 km of a noise-sensitive development.

2.12.2.2 SANS 10103

SANS 10103 provides guidance on assessing working and living environments with respect to acoustic comfort, excellence and possible annoyance by noise. It provides information on typical indoor and outdoor noise levels in various districts, of which the outdoor levels in rural districts are of relevance to this report

2.12.2.3 ETSU-R-97

In the UK, Guidance on the assessment of noise from wind turbines is provided by ETSU-R-97 *The Assessment and Rating of Noise from Wind Turbines*.

Both ambient noise and noise from wind turbines typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines.

2.12.2.4 The IOA Good Practice Guide

The Good Practice Guide (GPG) was published by the UK Institute of Acoustics (IOA) in May 2013 and has been endorsed by the UK Government as current industry good practice. The guide presents current good practice in the assessment of wind turbine developments at the various stages of the assessment process.

During the development of the GPG, a detailed study was undertaken of wind farm noise propagation and prediction methods used in a number of countries.

2.12.3 The Equator Principles (EPs) III, 2013

The principles applicable to the project are likely to include:

- Principle 2: Environmental and Social Assessment;
- Principle 3: Applicable Environmental and Social Standards;
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan;
- Principle 5: Stakeholder Engagement;
- Principle 6: Grievance Mechanism;
- Principle 7: Independent Review;
- Principle 8: Covenants;
- Principle 9: Independent Monitoring and Reporting; and
- Principle 10: Reporting and Transparency.

These principles, among various requirements, include a requirement for an assessment process and an Environmental and Social Management Plan (ESMP) to be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards, and the appointment of an independent environmental expert to verify monitoring information.

2.12.4 South African Wind Energy Facility Guidelines

The following guidelines are relevant to the proposed WEF and the potential impacts they may have on bats/avifauna and habitat that support bats/avifauna:

- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction. Fourth Edition: 2016;
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2014); and
- Birds and Wind-Energy Best-Practice Guidelines: Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa. Third Edition, 2015 (previous versions 2011 and 2012).
- Verreaux's Eagle and Wind Farms: Guidelines for impact assessment, monitoring, and mitigation. (March 2017)

2.13 Impact Assessment and Reporting

The primary objective of the basic assessment process is to present sufficient information to the competent authority (CA) and interested and affected parties (I&APs) on predicted impacts and associated mitigation measures required to avoid or mitigate negative impacts, as well as to improve or maximise the benefits of the project.

In terms of legal requirements, NEMA EIA Regulations regulate and prescribe the content of the BA Report and specify the type of supporting information that must accompany the submission of the report to the authorities. Table 2.2 shows how and where the legal requirements are addressed in this BA Report. Volume III of this BA Report contains the PPP undertaken to date. As the comments are received on the Draft BA Report these will be collated and included in the comments and response report.

The BA Report presents a summary of the findings and recommendations of all specialists.

As per the EIA Regulations 2014, as amended, "*the objective of the basic assessment process is to, through a consultative process-*

a) 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;

b) identify the alternatives considered, including the activity, location and technology alternatives;

c) describe the need and desirability of the proposed alternatives;

d) 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-

i. the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and

ii. the degree to which these impacts-

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be avoided, managed or mitigated; and

e) 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-

i. identify and motivate a preferred site, activity and technology alternative;

ii. identify suitable measures to avoid, manage or mitigate identified impacts; and

iii. identify residual risk that need to be managed or monitored.

The above activities are completed through consultation with:

- The lead authorities involved in the decision-making for the BA application (in this case, the DEA);
- The public, I&APs and other relevant organisations to ensure that local issues are well understood; and
- The specialist team to ensure that technical issues are identified.

The existing environment within which a proposed development is to be located is investigated, through a review of relevant background literature and ground-truthing.

A primary objective is to present key stakeholders with the findings of the assessments, obtain and document feedback and address all issues raised.

Table 2.2: Legislative Requirements for Scope of Assessment and Content of Basic Assessment Reports

Appendix 1 Requirements NEMA, 1998 (Act No. 107 of 1998)	**Location in BAR**
details of- *(i) the EAP who prepared the report; and* *(ii) the expertise of the EAP, including a curriculum vitae;*	Section 1.4 Appendix A
the location of the activity, including- *(i) the 21 digit Surveyor General code of each cadastral land parcel;* *(ii) where available, the physical address and farm name;* *(iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties;*	Table A Figure 1.1 Figure 7.1 Figure 7.2 Table 7.1
a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- *(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or* *(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*	Figure 7.2 Table 7.1
a description of the scope of the proposed activity, including- *(i) all listed and specified activities triggered and being applied for; and* *(ii) a description of the activities to be undertaken including associated structures and infrastructure;*	Table 2.1 Section 7
a description of the policy and legislative context within which the development is proposed including- *(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and*	Section 2 Section 5

Appendix 1 Requirements NEMA, 1998 (Act No. 107 of 1998)	Location in BAR
(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools framework, and instruments;	
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 5
a motivation for the preferred site, activity and technology alternative;	Section 6
a full description of the process followed to reach the proposed preferred alternative within the site, including- *(i) details of the alternatives considered;*	Section 6
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4 Volume III
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 4
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8-17
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- *(aa) can be reversed;* *(bb) may cause irreplaceable loss of resources; and* *(cc) can be avoided, managed or mitigated;*	Section 8-18
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 3.3 Volume II: Specialist Reports
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8-18
(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 8-18
(ix) the outcome of the site selection matrix;	Section 6
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Section 6
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 6 Section 7
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, including - *(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and* *(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;*	Section 8-18
an assessment of each identified potentially significant impact and risk, including- *(i) cumulative impacts;* *(ii) the nature, significance and consequences of the impact and risk;* *(iii) the extent and duration of the impact and risk;* *(iv) the probability of the impact and risk occurring;* *(v) the degree to which the impact and risk can be reversed;*	Section 8-18

Appendix 1 Requirements NEMA, 1998 (Act No. 107 of 1998)	Location in BAR
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and *(vii) the degree to which the impact and risk can be avoided, managed or mitigated;*	
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 19
an environmental impact statement which contains- *(i) a summary of the key findings of the environmental impact assessment;* *(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and* *(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;*	Section 19 Section 20 Figure 20.1
based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management outcomes, and the impact management outcomes for the development for inclusion in the EMPr;	Section 8-19 Appendix B: EMPr
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 20.1
a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.6 volume II: Specialist Reports
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 20
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;	n/a
an undertaking under oath or affirmation by the EAP in relation to- *(i) the correctness of the information provided in the reports;* *(ii) the inclusion of comments and inputs from stakeholders and I&APs;* *(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and* *(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; and*	Appendix A
where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	n/a
any specific information that may be required by the competent authority; and	n/a
any other matters required in terms of section 24(4)(a) and (b) of the Act.	n/a

3 METHODOLOGY

3.1 Feasibility Assessment

WKN Windcurrent (Pty) Ltd appointed Arcus to conduct a Feasibility Study for the Highlands Wind Energy Facilities in 2017.

This feasibility assessment involved:

- Conducting site visits to confirm desktop reviews, where necessary;
- Adding environmental and planning designations (e.g., landscape, nature conservation, archaeology);
- Identifying other designations of relevance; e.g.; regional renewable targets;
- Identifying nearby windfarm proposals and status;
- Identifying key biophysical constraints and / opportunities and potential red flags;
- Identifying key socio-economic constraints and / opportunities and potential red flags;
- Production of a preliminary overall environmental sensitivity map;
- Production of a preliminary biophysical sensitivity map; and
- Comment on the feasibility of the proposed development given the potential environmental impact and constraints and buffers applied.
- Identifying the potentially developable area within the available land; and
- Providing a list of key issues and conclusions.

The results of the feasibility assessment were used to develop the proposed turbine layout for assessment by the specialists, which represents the first step of 'embedded mitigation'

3.2 Assessment Techniques for the BA

Each of the specialist assessments follows a systematic approach to the assessment of impacts, with the principal steps being:

- Description of existing environment/baseline conditions;
- Prediction of likely potential impacts, including cumulative impacts (both positive and negative);
- Assessment of likely potential impacts (positive and negative);
- Identification of appropriate mitigation measures; and
- Assessment of residual (potential) environmental impacts.

3.2.1 Baseline Description

In order to evaluate the potential environmental impacts, information relating to the existing environmental conditions were collected through field and desktop research; this is known as the baseline. Specialists collected data from public records and other archive sources and where appropriate field surveys were carried out. Specific methodologies for each specialist's baseline description and impact assessments are presented in Volume II: Specialist Reports.

Climate change is expected to affect the proposed development site over the lifetime of the proposed development; however, the nature, scale and severity of climate change effects are uncertain. Given this uncertainty, the existing environment is assumed to remain constant throughout the lifetime of the proposed development, and forms the current and future baseline for the impact assessments.

The baseline was used to determine the sensitivity of receptors on and near the proposed development site and what changes may take place during the construction, operation and decommissioning of the proposed development and the impacts, if any, that these changes may have on these receptors.

3.2.2 Identification of Potential Impacts

The identification of potential impacts covers the three phases of the proposed development: construction, operation and decommissioning. During each phase, the potential environmental impacts may be different.

The project team have experience from environmental studies for other projects in the locality of the proposed development as well as other WEFs. The team are therefore able to identify potential impacts addressed in the BA based on their experience and knowledge of the type of development proposed and the local area. Their inputs informed the scope for the BA.

Each specialist assessment considered:

- The extent of the impact (local, regional or (inter) national);
- The intensity of the impact (low, medium or high);
- The duration of the impact and its reversibility;
- The probability of the impact occurring (improbable, possible, probable or definite);
- The confidence in the assessment; and
- Cumulative impacts.

Following identification of potential environmental impacts, the baseline information was used to predict changes to existing conditions, and undertake an assessment of the impacts associated with these changes.

3.2.3 Assessment of Potential Effects

The potential impact that the proposed Highlands South WEF may have on each environmental receptor could be influenced by a combination of the sensitivity and importance of the receptor and the predicted degree of alteration from the baseline state (either beneficial or adverse).

Environmental sensitivity (and importance) may be categorised by a multitude of factors, such as the rarity of the species; transformation of natural landscapes or changes to soil quality and land use.

The overall significance of a potential environmental impact is determined by the interaction of the above two factors (i.e., sensitivity/importance and predicted degree of alteration from the baseline).

Specialists, in their terms of references were supplied with a standard method with which to determine the significance of impacts to ensure objective assessment and evaluation, while enabling easier multidisciplinary decision-making. The methodology[4] is outlined below.

The table below, taken from the above guideline, indicates the categories for the rating of impact magnitude and significance.

The assessment methodology that was used is in accordance with the revised 2014 EIA Regulations (as amended). The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

[4] Adapted from T Hacking, AATS – Envirolink, 1998: An innovative approach to structuring environmental impact assessment reports. In: IAIA SA 1998 Conference Papers and Notes.

3.2.3.1 Extent (spatial scale)

L	M	H
Impact is localised within site boundary	Widespread impact beyond site boundary; Local	Impact widespread far beyond site boundary; Regional/national

3.2.3.2 Duration

L	M	H
Quickly reversible, less than project life, short term	Reversible over time; medium term to life of project	Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources

3.2.3.3 Intensity (severity)

Type of Criteria	Negative			Positive		
	H-	M-	L-	L+	M+	H+
Qualitative	Substantial deterioration death, illness or injury, loss of habitat /diversity or resource, severe alteration or disturbance of important processes.	Moderate deterioration, discomfort, Partial loss of habitat /biodiversity /resource or slight or alteration	Minor deterioration, nuisance or irritation, minor change in species/habitat/diversity or resource, no or very little quality deterioration.	Minor improvement, restoration, improved management	Moderate improvement, restoration, improved management, substitution	Substantial improvement, substitution
Quantitative	Measurable deterioration Recommended level will often be violated (e.g. pollution)	Measurable deterioration Recommended level will occasionally be violated	No measurable change; Recommended level will never be violated	No measurable change; Within or better than recommended level.	Measurable improvement	Measurable improvement

3.2.3.4 Probability of Occurrence

L	M	H
Unlikely; low likelihood; Seldom No known risk or vulnerability to natural or induced hazards.	Possible, distinct possibility, frequent Low to medium risk or vulnerability to natural or induced hazards.	Definite (regardless of prevention measures), highly likely, continuous High risk or vulnerability to natural or induced hazards.

3.2.3.5 Status of the Impact

The specialist should describe whether the impact is positive, negative or neutral for each parameter. The ranking criteria are described in negative terms. Where positive impacts are identified, use the opposite, positive descriptions for criteria.

3.2.3.6 Degree of Confidence in Predictions:

The degree of confidence in the predictions, based on the availability of information and specialist knowledge, is to be stated.

3.2.3.7 Consequence: (Duration x Extent x Intensity)

Having ranked the severity, duration and spatial extent, the overall consequence of impacts is determined using the following qualitative guidelines:

Intensity = L				
Duration	**H**			
	M			Medium
	L	Low		
Intensity = M				
Duration	**H**			High
	M		Medium	
	L	Low		
Intensity = H				
Duration	**H**			
	M			High
	L	Medium		
		L	M	H
		Extent		

Positive impacts are ranked in the same way as negative impacts, but result in high, medium or low positive consequence.

3.2.3.8 Overall Significance of Impacts

Combining the consequence of the impact and the probability of occurrence provides the overall significance (risk) of impacts.

PROBABILITY	**Definite Continuous**	H	MEDIUM		HIGH
	Possible Frequent	M		MEDIUM	
	Unlikely Seldom	L	LOW		MEDIUM
			L	M	H
			CONSEQUENCE		

3.2.3.9 Mitigation

Measures to avoid, reduce or remedy significant adverse impacts were identified; these are termed mitigation measures. Where the assessment process identified any significant adverse impacts, mitigation measures were proposed to reduce those impacts where practicable. Such measures include the physical design evolutions such as movement of turbines and management and operational measures. Design alterations such as the route

of the servitude to avoid certain sensitive receptors are mitigation embedded into the design of the proposed development, i.e., embedded mitigation.

This strategy of avoidance, reduction and remediation is a hierarchical one which seeks:

- First to avoid potential impacts;
- Then to reduce those which remain; and
- Lastly, where no other measures are possible, to propose compensatory measures.

Each specialist consultant identified appropriate mitigation measures (where relevant).

3.3 Cumulative Impact Assessment

In accordance with the EIA Regulations, consideration is also given to 'cumulative impacts'.

By definition, cumulative impacts are those that result from incremental changes caused by past, present or reasonably foreseeable future actions together with the proposed development. Cumulative impacts are the combined impacts of several developments that are different to the impacts from the developments on an individual basis. For example the landscape impact of one WEF may be insignificant, but when combined with another it may become significant.

For the purpose of this assessment cumulative impacts is defined and has been assessed in the future baseline scenario, i.e. Cumulative impact of the proposed development = change caused by proposed development when added to the cumulative baseline (The cumulative baseline includes all other identified developments. In the cumulative assessment the effect of adding the proposed development to the cumulative baseline is assessed.)

In line with best practice, the scope of this assessment will include all operational, approved or current and planned renewable energy applications (including those sites under appeal), within a 35 km radius of the site (as a minimum) (Figure 1.1).

The WEF sites included in the assessment of cumulative impacts has been based on the knowledge and status of the surrounding areas at the time of writing the BA Report.

Each of the specialists used existing publicly available information for the developments that occur within 35 km of the proposed Highlands South WEF, in order to assess the cumulative impacts. Cumulative impacts that have been considered are those residual impacts that remain medium to high post mitigation. It should be noted that this assessment is highly qualitative and based on specialists' knowledge.

4 PUBLIC PARTICIPATION

The primary aims of the public participation process are:

- To inform Interested and Affected Parties (I&APs) of the proposed development;
- To identify issues, comments and concerns as raised by I&APs;
- To promote transparency and an understanding of the project and its potential consequences;
- To facilitate open dialogue and liaise with all I&APs;
- To assist in identifying potential environmental (biophysical and socio-economic) impacts associated with the proposed development; and
- To ensure that all I&AP issues and comments are accurately recorded, addressed and documented in a Comments & Response Report.

Volume III of this report contains the Comments & Response Report which includes copies and proof of all correspondence.

4.1 Key Stakeholders

At this stage of the process, a number of key stakeholders have been identified and included on the project database. These key stakeholders include (but are not limited to) the following:

- Ratepayers' associations;
- Local farmers' associations;
- Local tourism organisations covering this part of the Karoo.
- CapeNature;
- ESKOM
- Eastern Cape Department: Economic Development Environmental Affairs, and Tourism (DEDEA);
- South African Bat Assessment Advisory Panel (SABAAP);
- National and Provincial Department of Water Affairs;
- Local bird clubs or interested bird watchers;
- BirdlifeSA;
- Department of Mineral Resources (DMR);
- National and Provincial Department of Agriculture, Forestry and Fisheries (DAFF);
- South African Heritage Resources Agency (SAHRA);
- South African National Roads Agency (SANRAL)
- South African Weather Service (SAWS);
- Sentech (state owned enterprise operating in the broadcasting signal distribution and telecommunications sectors);
- Department of Communications; and
- Air Traffic and Navigation Services SOC Limited (ATNS).

Additional relevant stakeholders will be identified during the PPP. Refer to Volume III which includes a copy of the latest I&AP database.

4.2 Initial Notification

An I&AP database was compiled consisting of project landowners, surrounding landowners within 5 km of the Proposed Development Site boundary, identified organs of state and organisations. This database will be updated throughout the duration of the basic assessment process and anyone with an interest in the proposed development is encouraged to register.

On 14 June 2018 initial notification letters (email and registered mail in English and Afrikaans) were sent to I&APs on the database, informing them of the intention of the applicant to apply for Environmental Authorisations for the proposed development. This included a locality map, proposed development plan and project descriptions. Details of how to submit comments and queries were included.

Site notice boards in English and Afrikaans were placed where the site boundary meets the R63 at 32°41'23.8"S 25°21'54.7"E and 32°41'23.8"S 25°21'54.7"E on 15 June 2018.

Notification posters in English and Afrikaans, encouraging I&APs to register on the database were placed on notice boards in Pearston at the post office, municipality, library, SAPS and a local supermarket on 15 June 2018.

In Somerset East notification posters were placed on notice boards at the SAPS, Langenhoven library, municipality, Spar supermarket, a hardware shop and a café. Photographs and coordinates of all placements are included in Volume III.

Newspaper advertisements in English and Afrikaans were placed in *The Daily Sun* Eastern Cape and *The Mid Karoo Express* on 21 June 2018. Proof thereof is included in Volume III.

4.3 BA Phase Public Participation

I&APs are able to register throughout the duration of the process and all registered I&APs are kept informed about the progress of the application.

The following tasks will be undertaken during the Basic Assessment process:

- Notification letters are sent out to registered I&APs, key stakeholders, and organs of state to inform them of the availability of the Basic Assessment Report (BAR) for review and comment (30 days);
- Focus Group or One-on One Meetings will be held as and when required;
- A Comments and Reponses Report is compiled, recording comments and/or queries received and the responses provided;
- Notification letters will be sent to all registered I&APs, key stakeholders, and organs of state to inform them of the decision by the DEA and the appeal procedure; and
- Placement of advertisements in the same local and regional newspapers (in English and Afrikaans) to inform I&APs of the decision taken by the DEA.

4.4 Summary of Issues Raised

Copies of all comments received from the public during the process, the review of the Draft Basic Assessment Report, any public meetings held will be collated in Volume III (Comments and Responses Report), which documents the issues raised and project team responses to the comments received. The original comments are included in Volume III.

To date no substantive comments regarding the proposed development have been received from I&APs by the EAP.

The social specialist has conducted interviews with several adjacent landowners as detailed in the Social Impact Assessment (Volume II).

In as far as could be established by the social specialist, commercial game farming is carried out on surrounding farms Buffelsfontein, Kamala Game Reserve, Kaalplaas (East Cape Safaris) and Klipplaat (Side by Side Safaris). Only the owners of Buffelsfontein, Kamala and East Cape Safaris could be contacted for comment. The owners of Klipplaat (Side by Side) declined to comment at this stage (Mr. Fleming Jensen, communicated via Mr. Grant Abrahamson, pers. comm). A number of other properties in the vicinity of the site (e.g. Mistkraal and Driefontein) also appear to support commercial game hunting operations. The owners of these properties could not be reached for comment. However, the concerns identified by the owners of Kamala and East Cape Safaris are likely to be relevant and apply to the other game-based operations in the study area.

Proposed turbines of the Highlands South WEF would be mainly visible to adjacent and near-adjacent properties located to the north, east and south of the site. The farmstead on Tevrede is the only non-site farmstead located within 2.5 km from the nearest proposed turbine. In addition, turbines are proposed within 2.5-5 km of the farmsteads on Kaalplaas, Uitkomst, and Driefontein, and within the same range for the lodges on Kaalplaas (East Cape Safaris lodge) and Klipplaat (Side by Side Safaris). The lodges on Kaalplaas and Klipplaat are located within a view shadow area. However, the majority of the remaining farm areas are visually exposed to the turbines located in the South WEF development area.

While the exact extent of Klipplaat (Side by Side Safaris) and Driefontein (also appears to be used for commercial hunting) are unknown, visually exposed portions of these properties appear to be located within 2.5 km of the proposed development area, with further portions located <5 km. To the north a large portion of Kamala is located within 8-10 km of the South WEF development area. Kamala Lodge is located ~10.3 km from the

nearest proposed turbine. The game farming operations on Kaalplaas and Klipplaat are therefore most visually affected by the turbines associated with the South Phase.

The R63 would be visually exposed, but the nearest turbine would be 7 km from the road. Similarly, the Cradock Road would be visually exposed. However the nearest wind turbine would be located 9 km away. A significant section of Waterford Road, which provides access to East Cape and Side by Side, is located within 5-10 km of the nearest turbine.

The owner of East Cape Safaris expressed concerns with regard to potential visual and sense of place impacts associated with the proposed Highlands Wind Energy Facilities. The concerns were related to potential visual impacts both during the daytime (turbines) and night-time (flickering lights) which would impact on the current 'African veld' experience offered to guests.

As stated above, the East Cape Safaris lodge is located within 2.5 – 5 km from the proposed turbine locations for Highlands South WEF, but in a view shadow area. The turbines would be visible from the majority of the farm. The visual specialists have considered this in their assessments. The significance of the impact was rated as medium negative and mitigation measures to be implemented include the positioning of turbines in less visually sensitive areas (already implemented), navigation lights to meet Civil Aviation Authority requirements and measures for the minimisation of lighting at substations and O&M buildings.

5 NEED AND DESIRABILITY

WEFs can play a role in mitigating or reducing climate change, addressing South Africa's energy resource constraints and producing low-cost energy. In addition, operating WEFs in South Africa contribute significantly to the economic development of the areas in which they are located through the requirements of the REIPPPP adjudication process. This section of the report highlights the national, provincial and local plans and policies that are in support of renewable energy facilities. Throughout this section, it is demonstrated that at all levels of governance, policy supports the development of renewable energy in order to address energy supply issues and to promote economic growth in South Africa.

Reference is made to the Department of Environmental Affairs (DEA) 2017 Guideline on Need and Desirability[5] which states that while the "concept of need and desirability relates to the type of development being proposed, essentially, the concept of need and desirability can be explained in terms of the general meaning of its two components in which need refers to time and desirability to place – i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed? Need and desirability can be equated to wise use of land – i.e. the question of what is the most sustainable use of land."

The need and desirability assessment answers the question of whether the activity or development is being proposed at the right time in the right place. The guidelines pose questions that should be considered in this investigation, which are addressed in Table 5.1 and Table 5.2 below.

[5]DEA (2017) Guideline on Need and Desirability. Department of Environmental Affairs (DEA), Pretoria, South Africa, ISBN: 978-0-9802694-4-4.

Table 5.1: Ecological Considerations of Need and Desirability for Highlands WEFs

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?		The ecological specialist study states: Although there are extensive areas of sensitive habitat within the wider Highlands site, the development footprint is restricted to the medium and low sensitivity parts of the site. These areas are considered suitable for development and there are no impacts associated with the Highlands WEF that cannot be mitigated to a low level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layouts provided for the assessment, the Highlands South WEF can be supported from a terrestrial ecology point of view.	Volume II: Fauna & Flora Specialist Basic Assessment
How were the following ecological integrity considerations taken into account?	*Threatened Ecosystems*	The National List of Threatened Ecosystems (2011) was used to identify and map listed ecosystems in need of protection. No threatened ecosystem falls within the site boundary.	Volume II: Fauna & Flora Specialist Basic Assessment
	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure	An ecological sensitivity map of the site was produced by integrating information collected on-site with available ecological and biodiversity information. Sensitive features such as wetlands, drainage lines, water bodies, steep slopes and rocky outcrops were mapped and appropriately buffered. The proposed layout avoids all areas of high and very high ecological sensitivity.	Volume II: Fauna & Flora Specialist Basic Assessment
	Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs")	Critical Biodiversity Areas (CBAs) were extracted from the Eastern Cape Conservation Plan. A small area (one turbine) of the Highlands South WEF falls within a Tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. This is not expected to have any significant impact on the CBA.	Volume II: Fauna & Flora Specialist Basic Assessment
	Conservation targets	The majority of the development footprint falls within the Camdeboo Escarpment NPAES Focus Area, indicating that the area has been identified as a potential target for the protected area expansion. The Camdeboo Escarpment Focus area is over 421 000 ha in extent and the loss of less than 10 000 ha from this focus area is not considered highly significant. The proposed	Volume II: Fauna & Flora Specialist Basic Assessment

[6]Section 24 of The Constitution of South Africa refers.

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
		development lies on the margin of the focus area and the extent of the development would not significantly impact the ability to meet conservation targets elsewhere within the focus area, which is large compared to the development site.	
	Ecological drivers of the ecosystem	The specialist concludes that the potential for disruption of broad-scale ecological processes and their drivers is low with recommended mitigation measures	Volume II: Fauna & Flora Specialist Basic Assessment
	Environmental Management Framework	No area-specific Environmental Management Framework exists for the site. The Sarah Baartman District Municipality IDP and the Cacadu District Municipality SDF provide environmental management goals and strategies. The proposed Highlands South WEF complies with all policies and planning tools.	Volume II: Social Impact Assessment
	Spatial Development Framework	The Cacadu District Municipality SDF highlights the following points relevant to the development: • The districts economy is dependent on the natural resources of the area; • The SDF should identify areas for renewable energy production; • Spatial planning must recognise that game reserves and farming are playing a bigger role in the economy; • Inappropriate land use change can have a negative impact on district resources and the economy; • The introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district. (Potential changes to the visual and cultural landscapes); • The protected area network together with the intended expansion areas (Nature reserves and parks) provide significant and expanding ecotourism opportunities within the District; • Both the tourism and productive components of the economy are dependent on effective access. (Transportation infrastructure). The location of the proposed WEF does not appear to conflict with the land use planning objectives contained in the SDF. The site does not appear to be located within a Tourism Focus Area or a Protected and Critical Biodiversity Area (Tier 1). In terms of land use, the site is located in an area designated as grazing potential. The area to the north of the site is however identified as a Tourism Focus area.	Volume II: Social Impact Assessment page 19-21

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
	Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	All global responsibilities to which South Africa is signatory or party to were assessed within this report. Applicable international treaties and conventions are: • UNFCCC Paris Agreement (2016) • The Convention on Biological Diversity (CBD) (1993) • The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) (1983) • The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (1999) The proposed development complies with all international responsibilities.	Volume II: Social Impact Assessment; Bird Impact Assessment; Bat Impact Assessment
How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		The proposed development can disturb listed plant species and vegetation from clearing of the development footprint, soil erosion and alien plant invasion. Increased levels of pollution, noise, disturbance and human presence can impact negatively on faunal communities. Biodiversity value and ecological functioning of the proposed development area are potentially affected by the development. Before the start of the Basic Assessment process detailed specialist feasibility studies were conducted to identify areas most environmentally suitable for development within the proposed development site boundary. As a result of these studies a development layout was produced that avoids sensitive areas and identified constraints. This layout was then assessed by the specialists in their Basic Assessment specialist reports presented here. The specialists proposed mitigation measures to further reduce residual risks or enhance opportunities during construction, operation and decommissioning phases of the development. With implementation of these mitigation measures, all identified negative impacts are expected to be reduced to acceptable levels of medium or low negative significance. All mitigation measures proposed by the specialists are included in the EMPr for each phase of the project.	Volume I App B: EMPr Volume II Specialist reports
How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		On a national level the development will lessen the country's dependency on coal, and contribute to lowering water consumption, pollution and environmental degradation per kW of electricity produced. The EMPr provides measures for avoidance and minimisation of pollution, as well as enhancing any potential positive impacts.	Volume I App B: EMPr
What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether,		The generation of waste will largely be restricted to the construction phase of the project and consist of normal construction phase solid waste streams.	Volume I App B: EMPr

"securing ecological sustainable development and use of natural resources"[6]		
Question	**Answer**	**Reference**
what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	The EMPr details specific mitigation measures that must be implemented for the appropriate management and minimisation of waste, during all phases of the project. Registered service providers will be utilised to transport solid waste to registered landfills.	
How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	A visual feasibility study was conducted to identify no go areas and areas most visually suitable for development. Visual buffers were applied to prominent topographic features, steep slopes, water features, roads, nature reserves and protected areas, private nature reserves, game farms, guest farms and resorts, farmsteads, towns, settlements and cultural landscapes / heritage sites. The development layout was produced by avoiding turbine placement within these visual buffers. A Heritage Impact Assessment and a Visual Impact Assessment were conducted to assess the developed layout. Comment from the relevant heritage authorities is being sought. Mitigation measures have been identified by the heritage specialists to minimise and remedy residual impacts, and enhance positive impacts, including: • Monitoring of all substantial excavations for fossil material on an on-going basis during construction; • Application of Chance Fossil Finds Procedure; • A 30 m buffer around all graves, ruins and buildings to be maintained and if not possible features to be cordoned off for their protection • Final walkdown survey of the authorised footprints to be carried out at least 6 months prior to start of construction in order for any archaeological mitigation to be carried out if required; • If any archaeological material or human burials are uncovered then work in the immediate area is to be halted. The fund is to be reported to the heritage authorities and may require inspection, excavation and curation in an approved institution; • Substation & O&M buildings to be located in visually unobtrusive positions or screened with earth berms and planting; • Location of the construction camp, batching plant and related storage/stockpile areas in unobtrusive positions in the landscape, away from arterial or district roads, or alternatively screening measures utilized. • Clear demarcation of construction camps, limited in size to only that which is essential.	Volume II: Heritage Impact Assessment & Visual Impact Assessment

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
		• Employment of dust suppression and litter control measures. Formulation and adherence to an Environmental Management Programme (EMPr), monitored by an Environmental Control Officer (ECO). • Areas disturbed during construction to be rehabilitated to original state.	
How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		Wind is a renewable resource and will be the 'fuel' for the WEF to generate electricity. Therefore the development will have a minimal impact on non-renewable resources.	n/a
How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What		The WEF will use the renewable energy resource of wind to generate power. Construction of the WEF will require use of water, a renewable natural resource. Operation of the WEF will consume relatively small quantities of water when compared to alternative energy technologies such as coal. Impacts on the ecosystem caused by use of these renewable energy resources has been evaluated.	n/a
	Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate,	The proposed WEF will reduce South Africa's dependency on non-renewable resources, particularly coal, as an energy source. Wind as an energy source is not dependant on water, as compared to the massive water requirements of conventional power stations, has a limited footprint and does not impact on large tracts of land, and poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants. The proposed WEF lies within a Renewable Energy Development Zone for wind energy.	n/a

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	*without compromising their quest to improve their quality of life)*		
	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)	The current land use is low-intensity grazing and the land is not suitable for other agricultural uses. The proposed development will increase yield as the landowners will be paid for the use of their land. This will improve cash flow and financial sustainability of farming enterprises on site. The proposed development itself will not cause a significant change in land use, as the development site is primarily low intensity agriculture (grazing), which can still proceed once the development is constructed. The opportunity cost of not proceeding with the proposed development is therefore likely to be high.	Volume II: Agricultural Impact Assessment; Social Impact Assessment
	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The proposed WEF is predicted to reduce dependency on coal as an energy source. Wind as an energy source is not dependant on water, as compared to the massive water requirements of conventional coal fired power stations, has a limited footprint and does not impact on large tracts of land, and poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants. The proposed WEF lies within a Renewable Energy Development Zone for wind energy, and a comprehensive cumulative impact assessment has been conducted.	n/a
How were a risk-averse and cautious approach applied in terms of ecological impacts?	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	The faunal component of the study is based on field observations of species and habitats as well as the results the camera trapping. This is supplemented with species records obtained from the various spatial databases and coverages. In many cases, these databases are not intended for fine-scale use and the reliability and adequacy of these data sources relies heavily on the extent to which the area has been sampled in the past. Many remote areas have not been well sampled with the result that the species lists for an area do not always adequately reflect the actual fauna and flora present at the site	Volume II: Fauna & Flora Specialist Basic Assessment
	What is the level of risk associated with the limits of current knowledge?	The risk associated with assumptions and limits of current knowledge is the potential for information being assessed to be incorrect. This would translate to erroneous impact identification and mitigation measures. However, due to the amount of site work conducted the risk associated with this is considered to be low.	Volume II: Fauna & Flora Specialist Basic Assessment

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	In order to counter the likelihood that the area has not been well sampled in the past and in order to ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study area and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account. Adopting a risk-averse and cautious approach in all stages of the impact assessment allows one to minimise the chance of assessing incorrect information and identifying erroneous impacts. This precautionary approach was utilised throughout the process by all specialists. The precautionary approach has been adopted for this study, i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts. Current gaps in knowledge include confirmation on the preferred turbine generating capacity and turbine technology to be used at this site. Ways in which these gaps are addressed are to consider the worst-case scenarios as noted above in terms of turbine size and generation capacity. Mitigation measures to manage these impacts have been identified.	Volume II: Fauna & Flora Specialist Basic Assessment
How will the ecological impacts resulting from this development impact on people's environmental right in terms following:	*Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?*	Impacts on people's rights have been identified and assessed by the social specialist, visual specialist and noise specialist. A visual feasibility study was conducted to identify no go areas and areas most visually suitable for development. Visual buffers were applied to prominent topographic features, steep slopes, water features, roads, nature reserves and protected areas, private nature reserves, game farms, guest farms and resorts, farmsteads, towns, settlements and cultural landscapes / heritage sites. The proposed development layout was produced by avoiding turbine placement within these visual buffers. The significance of the potential negative health risks posed by the development (noise, shadow flicker, electromagnetic radiation) is low. The noise impact assessment found the level of noise impacts for the Highlands South WEF to be of low to medium significance without mitigation and of low significance with mitigation. Mitigation measures proposed are the installation of turbines with lower noise emission than those assumed (worst case scenario), shutdown of selected turbines at night under relevant wind directions; removal of selected turbines; and /or relocation of farm workers from properties with the greatest noise impact. The impact on the sense of place is difficult to predict and would potentially be ambiguous. This is due to the subjective nature of perceptions regarding the relative attraction or	Volume II: Visual Impact Assessment; Social Impact Assessment; Noise Impact Assessment

"securing ecological sustainable development and use of natural resources"[6]			
Question		**Answer**	**Reference**
		disturbance of the WEF in a rural landscape. The visual impact has been assessed as part of the Visual Impact Assessment	
	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	The social impact assessment concluded that wind energy has fewer negative health effects than other forms of traditional energy generation and will have overall positive health benefits.	Volume II: Social Impact Assessment
Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?		The findings of the Social Impact Assessment (SIA) indicate that the development of the proposed Highlands WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The Highlands WEF site is also located within the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities. However, a key concern identified during the SIA relates to the visual impacts associated with the wind turbines and the potential impact on existing, well established game farming and hunting operations in the area, specifically the area to the north, east and south of the site.	Volume II: Social Impact Assessment
Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?		The ecology, avifauna, bat and aquatic specialists have all concluded that the development can proceed without having any unacceptable negative impacts that cannot be mitigated to a low or medium level of significance. Only a small portion of the Highlands South WEF (one turbine) falls within a tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. No significant impacts on the CBA are expected to occur.	Volume II: Fauna & Flora Specialist Basic Assessment
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the		The initial specialist site feasibility studies identified the most suitable areas for development for which a development layout was then produced for assessment. The results of the specialist's studies and assessments of this layout further refined and	Volume II: Specialist Reports

"securing ecological sustainable development and use of natural resources"[6]		
Question	**Answer**	**Reference**
alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	improved the proposed development layout resulting in the Final Mitigated Layout, as the best practicable environmental option.	
Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Given that the renewable energy projects in the area are not within viewing distance of each other and that they form part of a REDZ, the cumulative visual impact significance is considered to be Low (Negative) in the local context. The habitat loss resulting from the development is not likely to be significant, given the low total footprint of wind farm development in relation to the large extent of the affected NPAES focus area. With mitigation, the impact of habitat loss and future ability to meet conservation targets is likely to be of Low Significance. The cumulative effect of all impacts on bats and avifauna can be mitigated to levels of medium significance. All of the projects have indicated that aquatic impact avoidance as part of their layouts design process coupled mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts while improving the drainage or hydrological conditions within these rivers has been included to result in a cumulative impact that would be negligible. In the worst case scenario the significance of cumulative impacts during construction and operation is expected to be medium without mitigation, and low with mitigation.	Volume II: Visual Impact Assessment

Table 5.2: Socio-economic Considerations of Need and Desirability

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Question		**Answer**	**Reference**
What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:	*The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,*	A Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa identified eight ***Renewable Development Zones*** (REDZs). The REDZs identified areas where large scale wind energy facilities can be developed in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. The proposed Highlands WF falls within the Cookhouse Wind REDZ.	Volume II: Social Impact Assessment;

[7]Section 24 of The Constitution of South Africa refers.

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		The **Eastern Cape Provincial Growth and Development Plan (PGDP)** states that development of infrastructure is a necessary condition to eradicate poverty. Energy demands and electricity infrastructure rollout forms part of the Strategic Infrastructure Programme of the PGDP. The PGDP states that the, "…economic and logistics infrastructure – energy, roads, rail, ports, and air transport among others – is a necessary condition for economic growth and development." Infrastructure development, in turn, will have strong growth promotion effects on the agriculture, manufacturing and tourism sectors by improving market access and by "crowding in" private investment. Poverty alleviation should also be promoted through labour-intensive and community based construction methods. The high-level objectives of the Strategic Infrastructure Programme include consolidating and building upon the strengths of the Province's globally-competitive industrial sector through the development of world-class infrastructure and logistics capability in the East London and Coega IDZs. A reliable energy supply will be critical to achieving these objectives. The proposed WEF will assist to contribute to the future energy requirements of the Eastern Cape, and its proximity to the Coega IDZs will also benefit these key initiatives. The **Sarah Baartman District Municipality IDP** states that opportunities exist in the renewable energy sector with the area having been identified as one of three preferred locations in the country. It highlights the importance of investing in natural capital, including "creating new generation green jobs and local income streams rooted in renewable energy", developing the skills base, improving connectivity and utility infrastructure, and economic development in the green economy, tourism and skills development and education; The **Blue Crane Route IDP** notes that "wind generation initiatives in the Sarah Baartman District are fast growing with a large number of generation facilities under investigation" and the "the importance of wind energy generation in the district has been confirmed by the announcement by the Department of Energy in terms of successful wind farm developments, as three of the eight approved wind farm developments are to be developed in the district, with an additional wind farm to be developed in Nelson Mandela Bay Municipality." As part of the strategy to address challenges facing the rural areas the Development Bank of Southern Africa initiated the Rural Economic Development Initiative (REDI). The Sarah Baartman REDI, one of three pilot sites in South Africa, is a partnership between SBDM, the Development Bank of Southern Africa (DBSA) and other major stakeholders in the region aimed at identifying and unlocking economic potential to realize the latent economic growth potential of the district. Areas of intervention include (a) agri-innovation primarily in the areas of agro-processing, aquaculture, natural fibre beneficiation; *renewable*	

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Question		**Answer**	**Reference**
		energy and agri-tourism and (b) strategy and institutional development. The REDI process has identified a number of catalytic factors that could accelerate economic growth in the District including *renewable energy,* fibre innovation, the potential for agro-processing in key niches, tourism development and growing the education sector. The BCRLM IDP identifies a number of deliverables emanating from REDI. Of relevance to the proposed development are: • Renewable Energy Rapid Assessment and Audit; • Provincial Renewable Energy Coordinating Forum; • Land Use and Location Policy for Renewable Energy Projects; • Preparation of a Project Plan for the Establishment of a Wind Research and Training Centre in BCRM; • Investigation into the Social Economy and Identification of Interventions to Address Poverty and Unemployment. The primary sector focus of REDI in BCRLM will be on improving the performance of agriculture-related sectors (including priority sectors from phase one research, *renewable energy*, land restoration, agro-tourism and aquaculture). The IDP notes that the BCRLM has identified Local Economic Development (LED) as a key factor in the development of the BCRLM economy and all of its communities The LED strategy identifies six main pillars aimed at stimulating local economic development in Blue Crane Route Municipality. The following are of relevance to the proposed development: • Alternative sources of energy; • Enterprise Development; • Agricultural Development; • Tourism Development; • Investment in Human Capital.	
	Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	The Sarah Baartman Spatial Development Framework highlights the following: • The districts economy is dependent on the natural resources of the area;; • The SDF should identify areas for renewable energy production; • Spatial planning must recognise that game reserves and farming are playing a bigger role in the economy; • Inappropriate land use change can have a negative impact on district resources and the economy;	Volume II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		• The introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district. (Potential changes to the visual and cultural landscapes); • The protected area network together with the intended expansion areas (Nature reserves and parks) provide significant and expanding ecotourism opportunities within the District; • Both the tourism and productive components of the economy are dependent on effective access. (Transportation infrastructure).	
	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	The location of the proposed WEF does not appear to conflict with the land use planning objectives contained in the SDF. In this regard the site does not appear to be located within a Tourism Focus Area or a Protected and Critical Biodiversity Area (Tier 1). In terms of land use, the site is located in an area designated as grazing potential. The area to the north of the site is however identified as a Tourism Focus area. Impacts to the cultural landscape are visual/contextual in nature and, if development goes ahead, would definitely occur. The significance of this impact calculates to medium. Although mitigation measures can be suggested to reduce the overall intensity of the impacts, these will have no real effect on the impact significance which remains medium after mitigation. There are no fatal flaws in terms of the cultural landscape, especially since the area is a REDZ which encourages an accumulation of impacts in one area (admittedly far larger than the area considered for this assessment) and discourages a widespread proliferation of impacts across the wider landscape. The impacts to heritage resources are not significant enough to outweigh the social and economic impacts to be realised by the proposed project.	Volume II: Social Impact Assessment; Heritage Impact Assessment
	Municipal Economic Development Strategy ("LED Strategy").	The BCRLM has identified Local Economic Development (LED) as a key factor in the development of the BCRLM economy and all of its communities. The objectives for the Blue Crane Route LED Strategy that are relevant to the proposed development include: • Promote investor confidence in BCRLM through the provision of sound infrastructure and reliable services; • Promote SMMEs to increase employment opportunities; • Promote the development of the tourism sector.	Volume II: Social Impact Assessment;

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		The LED strategy identifies six main pillars aimed at stimulating local economic development in Blue Crane Route Municipality. The following are of relevance to the proposed development: • Alternative sources of energy; • Enterprise Development; • Agricultural Development; • Tourism Development; • Investment in Human Capital.	
Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?		The impact of creation of employment and opportunities during the construction phase is rated as of medium positive significance. The negative impacts associated with construction (impacts on family structures and social networks, influx of job seekers, risks to safety, livestock and farming operations, risk of fires, impacts from construction vehicles and impacts on farmland) can all be mitigated to levels of low negative significance. Positive impacts of the operation of the proposed facility are rated as high positive (clean renewable energy, creation of a community trust) and medium positive (creation of employment and business opportunities, support for local economic development, income generated for affected farmers) significance with enhancements. Negative impacts associated with the operation of the proposed facility are rated as medium with mitigation (impact on rural sense of place for adjacent game farm operations; impact on adjacent property values and operations; impact on adjacent game farming and hunting tourism) to low (impact on sense of place for others, impact on tourism in the region) The Socio-Economic Development and Enterprise Development commitments of the REIPPPP require a percentage of gross revenue from the operating wind farm to be invested in education, health, small business development etc. Projects are required to commit at least 1% of gross revenue towards socio-economic development. As an indication, 1% of gross revenue of a hypothetical 140 MW wind farm, with a capacity factor of 35% and a tariff of 80 c/kWh would equal approximately R3.5 m/year (and R68 million over the 20 year operation period of a project).	Volume II: Social Impact Assessment;
	Will the development complement the local socio-economic initiatives (such as local economic development	The proposed development will contribute towards the BCRLM LED strategy and skills development programs through the creation of employment and business opportunities, and the opportunity for skills development and on-site training during both construction and operation phases.	Volume II: Social Impact Assessment;

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
	(LED) initiatives), or skills development programs?		
How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?		The Sarah Baartman DM IDP identifies a number of key challenges including water supply, housing and services and maintenance of the road network. The initiatives for identified in the IDP that could benefit from the Community Trust include: <u>Increasing agricultural income:</u> • Facilitating investments in local and regional agro-processing operations; • Investing in research and knowledge sharing to improve the quality and resilience of crops and livestock; • Supporting local and regional food systems that keep wealth in rural communities. <u>Investing in Natural Capital:</u> • Promoting and incentivising natural resource restoration and conservation including alien vegetation clearing; • Creating new generation green jobs and local income streams rooted in ***renewable energy***; • Growing the rural tourism economy based on natural capital through agri-, adventure- and eco-tourism initiatives. <u>Broadening economic participation</u> • Promoting BBBEE, SMME and cooperative development; • Linking up with and maximising the opportunities for Extended Public Works Programme (EPWP) and Community Work programme opportunities; • Establishing community-based beneficiation projects; • Facilitating community and worker participation in share ownership; • Promoting social development investments. <u>Developing the skills base</u> • Improving the quality and quantity of school education and early childhood development (ECD) through partnerships; • Creating further education opportunities linked to work opportunities in the region; • Developing skills transfer partnerships between established and emerging farmers and between established and emerging businesses.	Volume II: Social Impact Assessment;

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		Improving connectivity and utility infrastructure • Assisting with the development of rural broadband and mobile phone connectivity.	
Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?		The Green Jobs Study found that wind energy facilities are socially and economically sustainable in the short and long term. IPP projects require a minimum ownership of 2.5% by local communities which represents a significant injection of capital into mainly rural areas of South Africa for the lifespan of the facility. In addition local content minimum thresholds result in a substantial stimulus for establishing local manufacturing capacity. A target requirement for BBBEE of 60% of procurement spend has raised employment opportunities for black South African citizens and local communities. Social economic development contributions are concentrated in the immediate vicinity of the IPPs and as such there is a lack of equity across geographical areas with some communities benefitting more than others.	Volume II: Social Impact Assessment;
In terms of location, describe how the placement of the proposed development will:	*result in the creation of residential and employment opportunities in close proximity to or integrated with each other,*	During the construction phase of the Highlands Wind Energy Facilities approximately 200-250 employment opportunities will be created, of which 55% will be for low-skilled workers, 30% for semi-skilled and 15% for skilled personnel. Members from the local communities (Pearston, Somerset East, and Cookhouse) are likely to be in a position to qualify for the majority of the low skilled and a proportion of the semi-skilled positions.	Volume II: Social Impact Assessment;
	reduce the need for transport of people and goods,	The need for transport of people and goods will be increased during the construction phase. Lower per capita carbon footprints are predicted due to the commercial forms of transport that will be employed to move the workforce (e.g. public transport, contractor buses).	Volume II: Traffic Impact Assessment;
	result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	not applicable	n/a
	compliment other uses in the area,	Local communities and their service providers will benefit from the socio-economic development provided by the WEF and current land use will be able to continue.	Volume II Social Impact Assessment;

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
	be in line with the planning for the area,	The proposed WEF is in line with applicable international, national, provincial and local planning strategies.	Volume II Social Impact Assessment
	for urban related development, make use of underutilised land available with the urban edge,	The proposed development occurs approximately 20 km beyond the urban edge of the nearest town, Somerset East	Volume II Social Impact Assessment
	optimise the use of existing resources and infrastructure,	Wind energy is a renewable, clean resource and reduces pollution and the reliance on non-renewable fossil fuels and water for electricity generation. Existing access roads will be utilised wherever possible. The existing Eskom transmission lines have the capacity to support this development. It is expected that any construction water required will be delivered by tankers. Waste removal will be in accordance with best practice as per the EMPr by qualified waste removal contractors to the nearest registered landfill. Portable sanitation facilities will be utilised during construction, so that no connection to the local sewerage system will be required. Any additional infrastructure required will be constructed by the developer.	Appendix B: EMPr Vol II: Social Impact Assessment
	opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	No opportunity costs in terms of bulk infrastructure expansions in non-priority areas are predicted due to the proposed development. The proposed WEF is not located within a bulk infrastructure expansion area.	Vol II: Social Impact Assessment
	discourage "urban sprawl" and contribute to compaction/densification,	Not applicable as the proposed development site lies outside of urban areas.	Vol II: Social Impact Assessment
	contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	The existing Eskom transmission bordering the proposed development site grid has capacity for additional energy generation. The proposed development will utilise this existing capacity. The project will contribute to economic and infrastructure development in the Eastern Cape Province, in line with the Eastern Cape Provincial Growth and Development Plan	Vol II: Social Impact Assessment
	encourage environmentally sustainable land development practices and processes,	Construction of the renewable energy Highlands WEF project will assist South Africa in transitioning from a carbon-intensive resource use economy to a sustainable low carbon footprint economy.	Vol II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		Sustainable land development is an overarching aspect of the proposed project development.	
	take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Feasibility of access for wind turbine delivery, the site is easily accessible from the national road; Close proximity to the Eskom grid with available evacuation capacity; Viable wind resource, therefore suited to wind farm development; The proposed site is transformed agricultural land and current land use is gazing; Willingness of landowners to host a wind farm on their properties; and Position within a Renewable Energy Development Zone for wind energy.	Section 6.2: Site Selection
	the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	The proposed development will create jobs and contribute towards socio-economic development in an area that does not have high economic potential. The WEF is likely to result in significant positive socio-economic opportunities. Please refer to the SIA for further information in this regard.	Vol II: Social Impact Assessment
	impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Impacts to the cultural landscape are unavoidable but only of a medium significance and no other aspects of heritage are expected to be impacted significantly.	Vol II: Social Impact Assessment; Visual Impact Assessment; Heritage Impact Assessment
	in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	The proposed development aligns with the Sarah Baartman DM IDP. One of the strategies of the IDP is implementing an integrated human settlement plan. Thus the proposed development is predicted to support the creation of a more integrated settlement.	Vol II: Social Impact Assessment
How were a risk-averse and cautious approach applied in terms of socio-economic impacts?:	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	The information contained in some key policy and land use planning documents, such as Integrated Development Plans etc., is based on the 2011 Census. Where relevant, information from the 2016 Community Survey has been added. The strategic importance of promoting wind energy is supported by the national and provincial energy policies. However, this does not mean that site related issues can be ignored or overlooked.	Vol II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The risk due to limits of current knowledge is considered to be low due to the positive socioeconomic impact expected from the proposed WEF.	Vol II: Social Impact Assessment
	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The approach to the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (DEADP, 2007).	Vol II: Social Impact Assessment
How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	*Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?*	Negative impacts were identified by the Social Specialist. These are: • Impacts associated with the presence of construction workers on local communities; • Impacts related to the potential influx of job-seekers; • Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site; • Increased risk of grass fires associated with construction related activities; • Noise, dust, waste and safety impacts of construction related activities and vehicles. • Visual impacts and associated impact on sense of place; The SIA details mitigation measures including locals first policy, establishment of a Monitoring fund, code of conduct, HIV/AIDS awareness programme; compensation policy with landowners, waste and fire management procedures part of EMPr,	Vol II: Social Impact Assessment
	Positive impacts. What measures were taken to enhance positive impacts?	Creation of employment and business opportunities, and the opportunity for skills development and on-site training: • Locals first policy, use local BBBEE contractors, establish a local skills database; • Inform local authorities and community representatives of final decision and potential job opportunities	Vol II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		• Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members; • Maximise opportunities for local content, procurement and community shareholding; • Establish a visitor centre. As indicated in the literature review, visitor centers in Scotland have attracted large numbers of visitors to wind farms. • Establish database of local service providers, specifically BBEEE companies, and notify of tender process and assist local BBBEEE companies to complete and submit required tender forms • SBDM and BCRLM in conjunction with local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.	
Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?		It is not expected that the development's socio-economic impacts will result in significant ecological impacts. The creation of jobs will cause some disturbance to the local fauna, particularly in the construction phase. This impact has been assessed as of low significance with mitigation measures applied.	Vol II: Social Impact Assessment; Fauna & Flora Specialist Basic Assessment
What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?		A suitable site within a REDZ was selected. A feasibility assessment was conducted. The layout was adjusted according to the results of the visual specialist investigation. Enhancements and mitigations recommended by the social specialist are being implemented.	Volume II Social Impact Assessment; Visual Impact Assessment
What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged	*Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?*	The proposed development aligns with a variety of planning policies that consider environmental and spatial justice. It falls within a REDZ.	Volume II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
persons (who are the beneficiaries and is the development located appropriately)?			
What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?		The proposed development will contribute to equitable access by supplying electricity to the national grid, and by providing local and regional socioeconomic benefits in terms of the REIPPPP Economic Development requirements, which includes BBBEE scorecard on which wind projects are evaluated.	Volume II: Social Impact Assessment
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?		Construction, operation and decommissioning of the proposed development will be done according to environmental health and safety legislative requirements and applicable guidelines.	Appendix B: EMPr
What measures were taken to:	*ensure the participation of all interested and affected parties,*	Public participation is being undertaken according to NEMA: EIA Regulations (2014) as amended and DEA (2017) Public Participation Guidelines.	Volume III; Comments & Response Report
	provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	The PPP is being undertaken in terms of legislative requirements and best practise guidelines. A Public Meeting will be held to present the findings of the Basic Assessment Report. All notifications have been provided in English and Afrikaans. Further languages are made available upon request.	Section 4; Volume III
	ensure participation by vulnerable and disadvantaged persons,	The PPP is being undertaken according to best practise guidelines; Notification of initiation of the PPP was provided in all required channels, i.e. newspaper adverts, site notices, local posters and written notifications.	Section 4; Volume III
	promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	The proposed development fits into the various planning policies including Contribution to the SBDM IDP and the implementation of a Community trust will assist the local strategies, including improving education facilities and youth development.	Vol II: Social Impact Assessment
	ensure openness and transparency, and access to information in terms of the process,	Legislative requirements and best practise guidelines are followed throughout the process.	Section 4

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		The PPP is being undertaken in terms of legislative requirements and best practise guidelines.	
	ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and	A PPP is being undertaken in terms of legislative requirements and best practise guidelines. A Social Impact Assessment forms part of the BA process. The independent Social Specialist ensures that all needs and values are taken into account.	Section 4; Volume II: Social Impact Assessment; Volume III
	ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	The Social Impact Assessment and PPP that are conducted according to legislation and guidelines will ensure that women and youth are recognised and involved in the process. REIPPPP requirements place specific responsibilities on IPPs in terms of women and youth development.	Volume II: Social Impact Assessment
Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g.. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?		The proposed WEF has a good planning fit with all applicable policies and will result in substantial local socio-economic opportunities. The key challenges facing the BCRLM are poverty and inequality in the rural areas and a shortage of skills. As such the proposed development will be of benefit to the local area by creating job and business opportunities, particularly for unskilled and semi-skilled local workers. To date the only negative impact for I&APs of the proposed development is a potential reduction in revenue for the adjacent local hunting industry (middle and high income community) through a change in sense of place for tourists, which is rated as of medium significance in the local context and of low significance in the regional context. Landowners of the proposed development site itself will benefit from an increase of revenue from low grazing potential land.	Volume II: Social Impact Assessment
What measures have been taken to ensure that current and/or future workers will be informed of work that potentially		Future workers on the proposed development will be educated on their rights to refuse work.	

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?			
Describe how the development will impact on job creation in terms of, amongst other aspects:	*the number of temporary versus permanent jobs that will be created,*	200-250 (full-time equivalent) employment opportunities will be created for 20-24 months during the construction phase. 20 full time employment opportunities will be created for the operational phase of the proposed development (minimum of 20 years).	Volume II: Social Impact Assessment
	whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	Members from the local community in the area are likely to be in a position to qualify for the majority of the low skilled and a proportion of the semi-skilled jobs. 55% of construction phase jobs will be for low-skilled workers, and 30% for semi-skilled.	Volume II: Social Impact Assessment
	the distance from where labourers will have to travel,	It is expected that most workers will reside in the nearby towns Pearston, Somerset East and Cookhouse.	Volume II: Social Impact Assessment
	the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	The majority of employment opportunities associated with the operational phase is likely to benefit HD members of the community. It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. A percentage of permanent employees who are not locally based may purchase houses in one of the local towns in the area, such as Somerset East or Cookhouse, others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy. This will benefit local businesses in the relevant towns. The benefits to the local economy will extend over the anticipated 20 year operational lifespan of the project. The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.	Volume II: Social Impact Assessment

"promoting justifiable economic and social development"[7]			
Question		**Answer**	**Reference**
		Procurement during the operational phase will also create opportunities for the local economy and businesses. The potential negative visual impact on the areas sense of place and rural character were identified as key concerns by surrounding hunting and game farm owners, whereas surrounding livestock farmers were less concerned about the visual impacts.	
	the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	Potential opportunity costs of the proposed development will be restricted to the 4 or 5 surrounding game farm and hunting operations. All of the operations cater for up-market overseas visitors and the existing "African veld" sense of place represents a key component of their marketing strategy for overseas hunters and visitors. The establishment of a wind farm on their western boundary would impact on the areas sense of place, which in turn, may impact on the ability to attract overseas visitors. This would in turn have a potential impact on their operations. The impact on their operations would in turn impact on other local sectors of the economy in the area that benefit from the game farming sector. As indicated in the SBDM IDP, the game farming sector has become an increasingly important sector in the area. However, a WEF in the area (Amakhala Emoyeni WEF) did not impact negatively on visitor numbers at Ezulu Private Nature Reserve whose boundary is 8 km from the closest turbine. The significance of this impact was rated as of medium negative significance. The creation of 200-250 temporary (20-24 month) jobs and 20 permanent jobs associated with the proposed development proceeding was rated as of high and medium positive significance.	Volume II: Social Impact Assessment
What measures were taken to ensure:	*that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and*	All applicable planning policies and legislation were considered. The proposed development fits with all planning policies. Organs of State were pre-identified and registered on the I&AP database.	Volume II: Social Impact Assessment
	that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	As registered I&APs all public correspondence including notifications of reports availability are provided.	Volume III
What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?		The proposed development aims to uphold the principles of sustainable development. The project team consists of suitably qualified individuals that comply with all legal requirements.	Section 1; Volume II: Specialist reports

"promoting justifiable economic and social development"[7]		
Question	**Answer**	**Reference**
Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Specialist input provides realistic mitigation measures. Rehabilitation to be undertaken after decommissioning of the proposed development will significantly reduce any potential legacy effects. Specific mitigation and rehabilitation measures are provided in the EMPr.	Appendix B: EMPr
What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The EMPr is a legally binding document, which when enforced during construction, operational or decommissioning phases, hold the applicant or their representative liable for any remedial actions as a result of negligence.	Appendix B: EMPr
Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	The alternative selection process included the assessment of the No Development alternative, site alternatives, design layout alternatives and technology alternatives.	Section 6
Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	<u>Cumulative Impact on Sense of Place:</u> Given that the renewable energy projects mentioned above are not within viewing distance of each other and that they form part of REDZ, the cumulative visual impact is considered to be of **low negative significance** in the local context. While certain stakeholders are opposed to the proposed development, others either support the development and or do not have an objection to the establishment of a WEF on the proposed site. This will also have implications for the perceptions of different people towards to the nature and significance of the cumulative impacts associated with wind farms on sense of place. However, the potential impact of wind energy facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications and the potential implications for other land uses, specifically game farming and associated tourist activities. <u>Cumulative impact on local services and accommodation</u> The establishment of the proposed 150 MW Highlands WF and the other renewable energy facilities in the SBDM and BCRLM may place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and	Volume II: Visual Impact Assessment; Social Impact Assessment

"promoting justifiable economic and social development"[7]		
Question	**Answer**	**Reference**
	operational phases of renewable energy projects proposed in the area, including the proposed WF. The potential impact on local services can be mitigated by employing local community members. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, municipal workers, school teachers, and the police, may no longer be able to buy or afford to rent accommodation in towns such as Somerset East, Bedford and Cookhouse. The LED Manager for the BCRLM interviewed as part of the Spitskop West WF SIA indicated that rental prices in Somerset East and Cookhouse had been driven up during the construction phase of the Amakhala Emoyeni Wind Farm. This impact is rated as of **low negative significance.** However, the potential impacts should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of renewable energy as an economic driver in the area. These benefits will create opportunities for investment in local towns, such as Somerset East and Cookhouse, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy will create an opportunity for economic development in the area. The Community Trusts associated with each project will also generate revenue that can be used by the SBDM and BCRLM in consultation with the Eastern Cape Provincial Government, 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 SBDM and BCRLM. <u>Cumulative impact on local economy</u> In addition to the potential negative impacts, the establishment of the proposed 150 MW WF and other renewable energy facilities in the area has the potential to result in significant positive cumulative socio-economic opportunities for the region, which, in turn, will result in a positive social benefit. There are a large number of renewable energy projects proposed in the study area. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits. The Overview of the IPPP (2017) confirms the benefits associated with renewable energy projects for local and regional economies. The total projected procurement spend for BW1 to BW4, 1S2 and 1S2 during the construction phase was R75 billion,	

"promoting justifiable economic and social development"[7]		
Question	**Answer**	**Reference**
	while the operational procurement over 20 years is estimated to be in the region of R72 billion. The reports note that the construction spend of R75 billion has resulted in a substantial stimulus for establishing local manufacturing capacity. Actual local content spend reported for IPPs that have started construction amounts to R38.1 billion against a corresponding project value (as realised to date) of R75.8 billion. This means 50% of the project value has been locally procured, exceeding the 45% commitment from IPPs and the thresholds for BW1 – BW4 (25%-45%). The report also notes that the REIPPPP has prompted several technology and component manufacturers to establish local manufacturing facilities. 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 extend over a period of 20-25 years. This impact is rated as of **high positive significance** with enhancements.	

5.1 Wind Energy Facilities' Contribution to Climate Change

The scientific consensus is that climate is changing and that these changes are in large part caused by human activities[8]. Of these human activities, increase in carbon dioxide (CO_2) levels due to emissions from fossil fuel combustion is regarded as a significant contributor to anthropogenic climate change.

South Africa is one of the world's largest emitters of CO_2 in absolute and per capita terms.

The following climate change impacts have been predicted in relation specifically to South Africa[9]:

- South Africa's coastal regions will warm by around 1 - 2°C by about 2050 and around 3 - 4°C by about 2100;
- South Africa's interior regions will warm by around 3 - 4°C by about 2050 and around 6 - 7°C by about 2100;
- There will be significant changes in rainfall patterns and this, coupled with increased evaporation, will result in significant changes in respect of water availability;
- Our biodiversity will be severely impacted, especially the grasslands, fynbos and succulent Karoo where a high level of extinction is predicted;
- Small scale and homestead farmers in dry lands are most vulnerable to climate change and although intensive irrigated agriculture is better off than these farmers, irrigated lands remain vulnerable to reductions in available water;
- Some predictions suggest that maize production in summer rainfall areas and fruit and cereal production in winter rainfall areas may be badly affected;
- Commercial forestry is vulnerable to an increased frequency of wildfires and changes in available water in south-western regions;
- Rangelands are vulnerable to bush encroachment which reduces grazing lands;
- Alien invasive plant species are likely to spread more and have an ever-increasing negative impact on water resources;
- Although strong trends have already been detected in our seas, including rising sea levels and the warming of the Agulhas current and parts of the Benguela current, we are not yet sure what impacts these could have on our seas, the creatures living in the seas or on the communities dependant on the sea;
- Because of our already poor health profile, South Africans are specifically vulnerable to new or exacerbated health threats resulting from climate change. For example, some effects of climate change may already be occurring due to changes in rainfall (droughts and floods) and temperature extremes and cholera outbreaks have been associated with extreme weather events, especially in poor, high density settlements; and
- There will be an increase in the frequency and severity of extreme weather events. Damage costs due to extreme weather-related events (flooding, fire, storms and drought) have already been conservatively estimated at being roughly 1 billion rand per year.

As explained in National Treasury's Carbon Tax Policy Paper (May 2013)[10], addressing the challenges of climate change through facilitating a viable and fair transition to a low-carbon economy is essential to ensure an environmentally sustainable economic development and growth path for South Africa. Further the Policy Paper states that the South African government is of the view that South Africa needs to reduce its greenhouse gas emissions while working to ensure economic growth, increase employment, and reduce poverty and

[8] http://adsabs.harvard.edu/abs/2013ERL.....8b4024C.

[9] http://www.cop17-cmp7durban.com/en/south-africa-on-climate-change/effects-of-climate-change-on-south-africa.html.

[10] National Treasury Carbon Tax Policy Paper. Available online http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf

inequality[11]. Renewable energy projects will play a significant role in meeting South Africa's targets in accordance with the Paris Agreement and assisting the transition to a low-carbon economy.

Renewable energy is valuable to the environment because these projects displace energy produced by fossil fuel (dirty coal, dirty gas, diesel etc.) and nuclear energy (risky and costly with almost perpetual and dangerous by-products) sources. A renewable energy project injects electrical energy into the grid and this energy becomes mixed with the energy produced by all the sources feeding into the grid. The effect is that less fossil and nuclear fuel is required to keep the grid balanced if you increase the fraction of renewable energy entering the grid.

For every kilowatt hour (kWh) that Eskom produces from fossil fuels, Eskom also creates about 1.1 kg of carbon dioxide (a gas strongly associated with global warming). In other words, if you use 450 kWh electrical energy at your home per month you are adding approximately half a ton (500 kg) to the concentration of carbon dioxide in the atmosphere.

5.2 Economic Development and Job Creation

The REIPPPP requires Economic Development ("ED") commitments from onshore wind energy projects and projects are adjudicated according to their ED commitments. The main ED beneficiaries of approved projects are currently communities living within a 50 km radius of renewable energy facilities. Projects are bid and thereafter adjudicated according to tariff (70%) and Economic Development (30%). There is therefore an incentive for projects to focus on Economic Development of the Local Community and to assign as much revenue, jobs, procurement etc. to local people as well as South African companies and people as possible in order to stand a chance of having a successful project.

Projects are adjudicated according to the following points:

Economic Development Elements	Weighting
Job Creation	25%
Local Content	25%
Ownership	15%
Management Control	5%
Preferential Procurement	10%
Enterprise Development	5%
Socio-Economic Development	15%
Total	**100%**
Total points	**30 points**

A number of these elements will have a significant and positive impact on the Local Community.

In terms of job creation, bidders are required to indicate the actual number of jobs that will be created for South African citizens, Skilled People, Black People, Skilled Black People and Citizens from the Local Communities. Significant skilled and unskilled job opportunities will be created in the Local Communities, particularly during the construction period.

For Ownership, bidders are required to indicate the total shareholding of the Project Company in the hands of Black People and Local Communities. The minimum ownership percentage for Local Community is 2.5% but projects have committed up to 40% Local

[11] http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf

Community Ownership in order to have a competitive project. Broad-based community trusts are established as a vehicle for Local Community Ownership to received dividend revenue from an operating project that will be invested in socio-economic development imperatives as determined by trustees. The ownership stake is funded either through debt or through equity partners ("a free-carry").

The Socio-Economic Development and Enterprise Development commitments require a percentage of gross revenue from the operating wind farm to be invested in education, health, small business development etc. Projects are required to commit at least 1% of gross revenue towards socio-economic development. As an indication, 1% of gross revenue of a hypothetical 140 MW wind farm, with a capacity factor of 35% and a tariff of 80 c/kWh would equal approximately R3.5 m/year (and R68 million over the 20 year operation period of a project). Projects in the REIPPPP receive additional points if the socio-economic and enterprise development investments are committed to be invested in the Local Community.

WEFs in South Africa will create skilled and unskilled jobs, particularly during the construction period. Under the REIPPPP, projects are incentivised to maximise the direct job creation opportunities, particularly for people in the communities surrounding the project.

WEFs tend to be constructed in rural areas with small communities and limited infrastructure and social amenities. A wind farm would create indirect jobs in accommodation, catering and other services that would support a wind farm and cater for the material and social needs of wind farm workers.

Localisation is considered one of the major contributors to job creation and general improvement of the economy of South Africa. Localisation through the construction of new manufacturing facilities to build wind turbine towers and other turbine components in South Africa is currently progressing.

Wind energy can provide technical skills to South Africans and thus improve the technical skills profile of the country and the regions where wind energy facilities are located. Through the REIPPPP, developers' own initiatives and through support from international donor agencies, a number of young South Africans are being trained on various aspects of wind farm construction and operation.

These projects, if successfully implemented, have the potential to transform for the better key development areas of South Africa and would assist South Africa in meeting its development goals, while meeting its carbon emission reduction targets as per international protocols.

5.3 Need and Desirability Conclusion

The need for the proposed development is supported in terms of meeting the country's climate change goals, and in terms of reducing the country's dependence on fossil fuels as the main source of meeting the country's electricity requirements. Both national and provincial policies and planning documents support the development of renewable energy facilities. The need and desirability for these types of developments play a role in meeting energy and climate change targets and also provide a socio-economic boost at the local level in areas that are in need of it. Based on the review of key planning documents that pertain to the study area it is clear that the development of renewable energy (including wind farms) in the SBDM and BCRLM is supported. However, there is a need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the areas tourism potential. In this regard the area to the north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF.

The Proposed Development lies within a REDZ for wind energy, and represents the desired technology to be developed in this specific area. The Proposed Development Site is

currently used for low intensity grazing and has little potential for other types of land use. Grazing could continue on the site during the construction and operation of the development. Therefore the change to a mixed land use of grazing and renewable energy would be an improvement to the area. As discussed in detail above, as well as in Chapter 6: Assessment of Alternatives, the proposed development represents the best practicable environmental option, identified through specialists' assessments.

A requirement of the REIPPPP is that in the development of any WEF, the local economy must benefit through employment opportunities, skills development, and the development or enhancement of community infrastructure. The cumulative effect of the proposed development and other developments in the area has the potential to result in highly significant positive socio-economic opportunities for the region.

6 ASSESSMENT OF ALTERNATIVES

Alternatives are different means of meeting the general purpose and need of a proposed development and may include alternative sites, alternative layouts or designs, alternative technologies and the "no development" or "no go" alternative. One of the objectives of the Basic Assessment process is to 2(b) Identify the alternatives considered, including the activity, location, and technology alternatives. This section describes alternatives in relation to the proposed development. Table 6.1 provides a summary of this assessment.

The EIA Regulations indicate that alternatives that are considered in an assessment process should be reasonable and feasible, and that I&APs should be provided with an opportunity to provide inputs into the process of formulating alternatives.

The assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-development or "no-go option" alternative as a baseline scenario;
- A comparison of reasonable and feasible selected alternatives; and
- The provision of reasons for the elimination of an alternative.

6.1 The No Development Scenario / "No-Go" Option

This scenario assumes that the proposed development does not proceed. It is equivalent to the future baseline scenario in the absence of the proposed development.

Relative to the proposed development, the negative implications of this scenario include:

- The land-use remains agricultural, with no further benefits derived from the implementation of a complementary land use;
- There is no change to the current landscape or environmental baseline and biodiversity;
- No additional electricity will be generated on-site or supplied through means of renewable energy resources. This would have negative implications for the South African government in achieving its proposed renewable energy target, given the need for increased generation;
- No impact on the local game hunting tourism operations and property values of properties in the immediate vicinity of the proposed development;
- No opportunity for additional employment (permanent and temporary) and business opportunities in the local area where job creation is identified as a key priority;
- No benefit to the local communities and local economic development from a Community Trust over a 20 year period;
- The national and local economic benefits associated with the proposed project's REIPPPP commitments and broader benefits would not be realised.

The purpose of the proposed development is to generate renewable electricity and export this to the national grid. Other socio-economic and environmental benefits will result from the proposed development such as:

- Reduced air pollution emissions - burning fossil fuels generates CO_2 emissions which contributes to global warming. Emissions of sulphurous and nitrous oxides are produced which are hazardous to human health and impact on ecosystem stability;
- Water resource saving – conventional coal-fired power stations use large quantities of water during their cooling processes. WEFs require limited amounts of water during construction and a minimal amount of water during operation. As a water stressed country, South Africa needs to be conserving such resources wherever possible;
- Improved energy security – renewables can be deployed in a decentralised way close to consumers, improving grid strength while reducing expensive transmission and distribution losses. Renewable energy projects contribute to a diverse energy portfolio;
- Take advantage of significant natural renewable energy resources – solar and wind resources remain largely unexploited;
- Sustainable energy solutions – the uptake of renewable energy technology addresses the country's energy needs, generation of electricity to meet growing demands in a manner which is sustainable for future generations;
- Addressing climate change - Climate change is widely considered by environmental professionals as one of the single largest threats to the environment on a local, national and global scale; and
- Employment creation and other local economic benefits associated with support for a new industry in the South African economy.

The 'No Development' alternative would not assist the government in addressing climate change, energy security and economic development. Implementing this option would also not allow for any beneficial socio-economic and environmental impacts as outlined above.

Some surrounding landowners are objecting to the development of a wind energy facility in the area on the grounds that it could negatively impact their hunting tourism operations. However, proceeding with the development will create a substantial amount of jobs and opportunities for the local community which could offset any potential negative effects. In addition, the area has been designated a Renewable Energy Development Zone suitable for wind farm development in particular by the Department of Environmental Affairs, following a Strategic Environmental Impact Assessment (SEA). This SEA identified areas where large scale wind energy facilities can be developed in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country.

Based on the above, the 'No Development' alternative is not a preferred alternative.

6.2 Site Selection

Once a site has been identified as a possibility, the Developer models a 'Virtual Wind Farm' to understand the potential for a wind farm project at the site. If the site shows potential, the landowner is approached and the land secured by means of a long-term lease. Once this has occurred the next step is for Monitoring and Pre-feasibility.

The Pre-feasibility part of this stage includes a range of preliminarily considerations which are investigated to evaluate the project sites:

1. Grid connection options and capacity availability on the existing national grid;
2. The feasibility of site access;
3. Technical construction issues such as geological conditions and topography;

4. Preliminary high level environmental considerations regarding the presence of internationally, nationally, provincial and local protected areas, identified heritage sites, hydrology (including perennial and no-perennial waterways, dams and wetlands, etc.), location of houses, roads etc. based on publicly available data or preliminary on-site investigations. Publicly available data is obtained from sources such as the Endangered Wildlife Trust (EWT), Cape Nature, Birdlife SA, SANBI, local wildlife groups and other publicly available georeferenced environmental data of South Africa. At this stage of a development initial consultation with key statutory and non-statutory organisations such as Birdlife SA, EWT, SANBI and Provincial/National Department of Environmental Affairs may be completed.

Only if no initial, high level issues are identified, a monitoring mast is erected on preferred project sites to measure on site wind. A minimum of 12-months data collection is required in order for the wind data to be considered bankable.

The next stage is Full Feasibility, which includes the Basic Assessment or Scoping and EIA process. The aim of this phase is to address the project at a more detailed level, so as to advance the decision on if the project should proceed, and if so, what are the limitation and constraints to development. This includes consideration of key commercial, environmental, technical and legal issues. The aim for this stage is to inform the decision that the site can be financed and constructed. Since the developer makes a firm commitment towards the project at this point, this is a very important step in the selection process of project sites and the moment when the project is introduced into the public domain. The EIA is one of the key actions identifying site specific environmental feasibility and constraints at the Full Feasibility stage. The EIA therefore forms an important stage in informing the progression of the project, its design, and facilitates the introduction to the public.

In brief, the selection process is a detailed process of identification and elimination of sites and starts with identifying a potentially viable site through the presence of suitable wind resource. This is done at a macro scale using wind modelling techniques. Areas with favourable wind regimes at this scale can then be scaled down using more refined modelling techniques, and the process of ruling out sites through considering applicable constraints. Sites which are found to be suitable in terms of both wind resource and constraints, including environment considerations, are taken forward to the application for Environmental Authorisation.

WKN-Windcurrent has and continues to develop a portfolio of sites across South Africa including sites in the Eastern Cape. The proposed Highlands WEF was selected out of WKN-Windcurrent's portfolio based on anticipated wind resource (high wind speeds), proximity to existing grid infrastructure, land availability, minimum technical constraints from a construction perspective and absence of high level environmental issues at the Monitoring and Pre-feasibility stage.

Further on-site wind monitoring is currently underway from anemometer masts and SODAR devices in order to confirm the wind resource on site and improve the accuracy of existing wind data as well as to inform the most efficient turbine layout.

The tables below provide further detail on the site selection process in relation to the proposed development, which was selected based on consideration of a range of potential sites at the time. This does not present the full WKN-Windcurrent portfolio of projects as this changes with time. It reflects the projects being considered at the time of selection of the proposed Highlands WEF to be taken forward to the Full Feasibility stage, including the EIA process.

Based upon the analysis as summarised above and in the Alternatives Tables below, the proposed Highlands WEF site is the Preferred Site.

Table 6.1: Alternatives Table for the Proposed WEF – Investigated Regions

Factor	Region A – Preferred Region	Site B	Site C	Site D
Location Descriptor	Inland Eastern Cape	Inland Eastern Cape	Inland Eastern Cape	Inland Eastern Cape
Wind Resource	Good based on installed wind measurement masts	Below Average based on installed wind measurement mast	Good based on desktop data	Good based on desktop data
Grid Connection	Available on site	Available close to site	Available close to site	Limited connection capacity available on site
Land Use and Land Availability	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure
Site Access	Good	Moderate - difficult	Good	Good
Environmental Sensitivity	Low-medium sensitivity	Low-medium sensitivity	High sensitivity – avifaunal concerns (Rudd's Lark, Cape Vulture)	High sensitivity – avifaunal concerns (Cape Vulture)
Status of Development / Decision	Advanced to Feasibility Stage	Not advanced	Not advanced	Not advanced

Table 6.2: Alternatives Table for the Proposed WEF – Specific Site Selection within Preferred Region

Factor	Suitability of the Preferred Site	Suitability of Area North of Preferred Site	Suitability of Area East of Preferred Site	Suitability of Area South of Preferred Site	Suitability of Area West of Preferred Site
Land Availability	The site is located on rolling hills that offers suitable buildable area for a full 150MW facility. The landowner has signed consents for the undertaking of the EIA process.	Not pursued due to several factors: Area not located in REDZ Inaccessible mountainous terrain	Not pursued due to several factors: Low-lying land to East of Preferred site has poor wind resource	Not pursued due to several factors: Area not located in REDZ	Not pursued due to several factors: Area not located in REDZ Low-lying land beyond escarpment has poor wind resource
Land Use	Transformed land currently used for low density livestock farming.	Commercial game hunting - unsuitable	Commercial game hunting - unsuitable.	Commercial game hunting - unsuitable.	Combination of livestock farming, hunting and protected area.
Environmental Sensitivity	Although the site does contain environmental features that have to be avoided due to high environmental sensitivity, suitable area is still available, following these exclusions, to develop a 140 MW facility.	High sensitivity – mountainous terrain with confirmed Verreaux's Eagle nest	Moderate sensitivity - closer to the town of Somerset East and confirmed Cape Vulture colony. Also more risk of cumulative impacts due to proximity to existing wind energy facilities.	Likely to be similar to Preferred Site, but confirmed Verreaux's Eagle nest, slightly more mountainous terrain, and less accessible.	Moderate-high sensitivity – due to cave used for bat roost
Wind speed levels	Feasible wind speed confirmed through over one year of onsite wind monitoring.	Likely to be feasible wind speed based on elevated terrain and satellite data, however the area is inaccessible.	Likely to be below that of preferred site, based on lower altitude and according to satellite data.	Likely to be below that of preferred site, based on lower altitude and according to satellite data.	Likely to be below that of preferred site, based on lower altitude and according to satellite data.
Distance to grid	Two Eskom overhead powerlines with available capacity traverse the Northern portion of the site.	Two Eskom overhead powerlines with available capacity in close vicinity	Two Eskom overhead powerlines with available capacity in close vicinity	Much greater distance to the two Eskom overhead powerlines with available capacity	Two Eskom overhead powerlines with available capacity in close vicinity
Status of Development / Decision	Advanced to Feasibility Stage	Not advanced	Not advanced	Not advanced	Not advanced

6.3 Design Evolution Alternatives

Following the selection of a suitable site, consideration is given to the design of the development layout within that site. It is important that wind turbines are sited in the optimum position to maximise the wind energy yield whilst minimising environmental impacts as far as possible.

The Developer therefore commissioned Arcus to conduct a multi-disciplinary high level site feasibility assessment to identify any areas known to be unsuitable for development and determine the sensitivity of the remaining site. The output of this assessment was a preliminary site sensitivity map used to ascertain if development within this area was feasible. Based on the results the Applicant then developed a preliminary development layout that avoids all no-go areas and areas of high sensitivity, and prioritised areas of low sensitivity where possible. This layout was given to the specialist team to assess in their specialist impact assessment reports (The Proposed Layout). Based on the results of their assessments the layout was revised further in order to give consideration to all the specialist mitigation requirements. This is referred to within this report as the Final Mitigated Layout.

Table 6.3 indicates the location of the turbines, pre and post specialist assessment and indicates the final preferred locations to be considered for authorisation.

Table 6.3: Turbine Layout Design Evolution[12]

	The Proposed Layout		**The Final Mitigated Layout**	
WTG No.	**Latitude**	**Longitude**	**Latitude**	**Longitude**
32	-32.7524	25.35831	-32.7524	25.35831
33	***-32.7574***	***25.35527***	***-32.7578***	***25.35548***
34	-32.7572	25.36676	-32.7572	25.36676
35	-32.7618	25.36331	-32.7618	25.36331
36	-32.7674	25.36993	-32.7674	25.36993
37	-32.7711	25.37862	-32.7711	25.37862
38	-32.7834	25.35451	-32.7834	25.35429
39	***-32.7887***	***25.36162***	***-32.7886***	***25.36115***
40	-32.787	25.36886	-32.787	25.36886
41	-32.7912	25.3824	-32.7912	25.3824
42	***-32.7946***	***25.36739***	***-32.7942***	***25.36754***
43	***-32.8013***	***25.35979***	***-32.8011***	***25.35878***
44	-32.8075	25.38289	-32.8075	25.38289
45	-32.8121	25.37925	-32.8121	25.37925
46	-32.81	25.37013	-32.81	25.37013
47	***-32.8161***	***25.37153***	***-32.8157***	***25.37018***
48	-32.813	25.35957	-32.813	25.35957

[12] Coordinates in bold italics indicate turbines that have been relocated in response to the findings of the specialist studies.

49	-32.8167	25.34562	-32.8167	25.34562

6.4 Technology Alternatives

Additional renewable energy technologies include hydro-electric power, photovoltaic solar or concentrated solar power. The site itself has no resource for hydro-electricity. The site topography is less suited to the construction of large scale ground mounted solar facilities. Solar electricity generation would also require a much greater infrastructure footprint and water consumption (for cleaning panels) to generate the equivalent energy of the proposed WEFs. Wind farms are less land intensive and water intensive than solar projects.

Wind energy is likely to present less of an impact on the continued use of the land for grazing, as it does not result in the shading that occurs from solar facilities which may affect vegetation and consequently farming practices. Whilst there are potential impacts associated with wind energy which are not associated with solar, such as collision risk with avifauna, there are different potential impacts for solar facilities such as loss of habitat and foraging areas for avifauna and other ecological receptors.

Based on the site's physical characteristics and existing land uses, the renewable energy technology best suited to the site, taking into account the potential environmental impacts, is a WEF.

Various wind turbine designs and layouts will be considered for the site in order to maximise the electricity generation capacity and efficiency, whilst taking into account environmental constraints. The turbine manufacturer and turbine model has not yet been determined and will not be decided upon until the completion of further wind analysis and competitive tendering.

6.5 Alternative Assessment Summary

Table 6.4 provides a summary of the alternatives considered in the selection of the preferred alternative. Based on this assessment, it was decided that the proposed location of the WEF will be the Highlands site, located in the Eastern Cape Province. Through the feasibility process the design of the WEF was developed taking into consideration environmental constraints. These constraints were provided by the specialists, and included no-go areas based on avifaunal and bat constraints, as well as floral and faunal constraints, aquatic buffers, and visual constraints. A provisional layout for the proposed development was designed based on these constraints, and provided to the specialists to use as part of the impact assessment phase (The Proposed Layout). The specialist's detailed assessments resulted in constraints being refined or added so that this provisional layout has continued to evolve throughout the process. The Final Mitigated Layout takes into account all final specialist findings and recommendations, as well as geo-technical aspects of the site. The Final Mitigated Layout is submitted to the DEA for authorisation, and if approved and awarded preferred bidder status, this layout will further be developed, through micro siting of turbines and roads, with the assistance from the relevant specialists.

Table 6.4: Assessed Alternatives Summary

Alternative Type	Alternative description	Advantages	Disadvantages	Result
No Development	The proposed development does not proceed	• No change in current landscape or environmental baseline • No risk of negative environmental and social impacts • No impacts on local hunting tourism industry	• Land use remains low agricultural, without benefits from complimentary land use • No additional electricity will be generated through renewable resources • No opportunity for additional employment (permanent or temporary) in an area where job creation is identified as a key priority • No socio-economic benefits for the community associated with the establishment of a Community Trust • The government will not be assisted in addressing climate change, energy security and economic development • No development in an area earmarked and suitable for such specific development (REDZ)	Not reasonable
Preferred Location	The Proposed Development Site	• Good wind • Accessible for wind turbine delivery • Proximity to Eskom grid • Surrounding area not densely populated • Site is transformed agricultural land with current land use grazing • Within the Cookhouse REDZ	• Potential visual sensitive receptors • Potential loss of sense of place • Potential ecological sensitivities • Potential negative impact on surrounding hunting and game farm operations	Reasonable and feasible
Location	Different location in the area	• None identified	• No landowner consent; • Longer grid connection and access roads possibly required; • No wind data.	Reasonable not feasible
Technology	Wind Energy Facility	• Emits no CO_2 and has no fuel costs • Low water consumption compared to conventional power stations	• WEFs pose collision risk to birds and bats • Potential visual impact and impact on sense of place;	Feasible and reasonable

Alternative Type	Alternative description	Advantages	Disadvantages	Result
		• Can share land use with other activities • Small footprint (little habitat loss) compared to other means of equivalent electricity generation • Low water consumption and pollution compared to conventional power plants • Contributes to government renewable energy goals. • Stable, consistent and reliable resource for the long term. • Less amount of maintenance required and therefore higher availability of machines compared with nuclear, coal and gas (around 97% compared with around 50% for conventional power stations).	• Potential impact on surrounding game farm operations • Dependent on availability of wind in any given time in one place, but if located at different wind spots widely over the country, this is not an issue. • New skills and training required in workforce (this could also be seen as an advantage).	
Technology	Photo-voltaic	• Solar PV poses less risk to birds and bats; • Lower visual impact on surrounding game farms.	• Site topography not suitable for large scale ground mounted solar facilities with equivalent output • Solar power has much larger footprint (habitat loss) • Dependent on cloud cover • Water use for cleaning panels.	Not reasonable
Technology	Concentrated Solar Power	• No collision risk to bats	• Site topography less suitable for large scale ground mounted solar facilities • CSP poses collision risk to birds and loss of foraging habitat • Visual impact on surrounding game farm operations	Not reasonable
Technology	Hydro-electric	• Almost no emissions and no fuel costs • Large-scale and stable electricity generation • No risk of collision for birds & bats	• No hydro-electric resources in area • Significant impact on the landscape and river systems	Not feasible
Technology	Biomass	• Carbon neutral over time	• More expensive than other forms of energy	Not feasible

Alternative Type	Alternative description	Advantages	Disadvantages	Result
			• Biomass supply difficult to secure at present	
Technology	Coal-fired power plant	Established skills sector. "Business-as-usual" means immediate job stability for coal miners.	• Abundant but expensive to extract. • emits high levels of CO2, major pollutant and contributes to climate change • coal mining impacts significantly on the environment • Non-renewable resource • Took over 1 million years to form under the earth's surface and is irreplaceable once extracted. • Price volatility. • More expensive than wind energy • High water consumption to produce electricity. • Procurement at expense of wind/solar means loss of jobs in younger clean technology industries	Not reasonable
Technology	Nuclear power	• Low carbon footprint	• Most expensive form of energy; requires major investments • Safety concerns (highly radioactive raw and waste material) • Radioactive toxic waste product • Very long timelines until energy generation can start. • Low job creation potential. • Proposed location not suitable for nuclear power.	Not reasonable or feasible
Design	Final Mitigated Layout (Preferred Alternative)	• Maximises wind • Minimises negative impacts • Enhances positive impacts	• Potential residual negative impacts of low to medium significance	Reasonable and feasible

7 THE PREFERRED ALTERNATIVE

Based on the alternatives analysis, the 150 MW Highlands Wind Energy Facilities, and associated infrastructure, including grid connection infrastructure was chosen as the preferred alternative as the best practicable environmental option (The Proposed Development - Figure 7.1).

There are two existing Eskom Transmission lines located within the Proposed Development Site boundary, one a 66 kV and the other a 132 kV. Both have a limited available capacity, and both will be required to connect the Highlands WEFs to the national grid. It is unknown at this stage how many turbines can connect to which each line, based on uncertainty surrounding the available capacities on each line and the downstream constraints (for example the Eskom main transmission system (MTS) substations). The technical and financial feasibility for the optimum split will be determined on finalising the ongoing analysis of meteorological data – this will ultimately determine whether the larger of the two projects connecting to the 132 kV line will be located to the north or the south of the smaller project connecting to the 66 kV line.

Therefore, for the purpose of obtaining Environmental Authorisation (EA), and bidding requirements in the Department of Energy's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), the project has been split into six components:

- Highlands North Wind Energy Facility (WEF);
- Electrical Grid Connection and Associated Infrastructure for Highlands North WEF;
- Highlands Central WEF;
- Electrical Grid Connection and Associated Infrastructure for Highlands Central WEF;
- **Highlands South WEF**; and
- Electrical Grid Connection and Associated Infrastructure for Highlands South WEF.

This report and application pertains to the **Highlands South WEF (The Proposed Project)**.

7.1 Description of the Highlands South WEF (The Proposed Project)

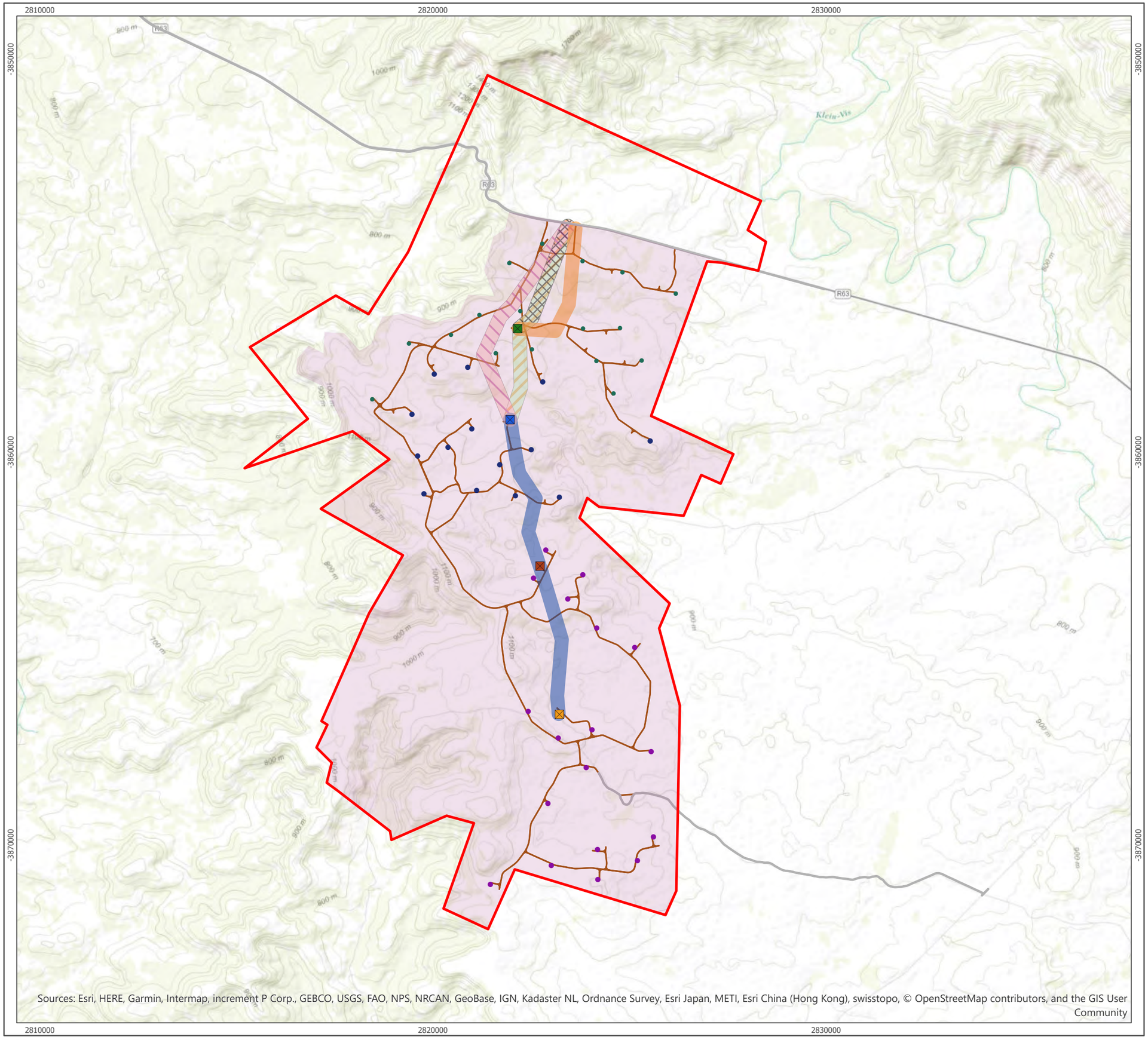
The Highlands South WEF (Figure 7.2) will consist of up to 18 three-bladed horizontal-axis turbines with a maximum hub height of 135 m and rotor diameter of up to 150 m, with a generating capacity of up to 5 MW each. A maximum height to blade tip of 200 m will be considered. Internal roads will connect the turbines. On-site cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground. Two on-site substation locations (Substation C1 and C2) form part of this application.

The final choice of turbine will be dependent on the technology available at the time of construction, project economics and the desired output from the development.

Should a positive Environmental Authorisation (EA) be obtained for this WEF, and in the event that no change in evacuation capacity has occurred, the applicant will implement the approved layout to suit evacuation capacity, current policy and turbine type at the time of development.

7.2 Site Description and Location of the Proposed Project

The Proposed Highlands South WEF is located approximately 20 km west of the town of Somerset East, bordering the south of the R63 route, approximately 23 km south-east of Pearston, in the Eastern Cape Province. The Proposed Development site is located in the Blue Crane Route Local Municipality (BCRLM) in the Sarah Baartman District Municipality (SBDM), previously known as the Cacadu District Municipality.



ARCUS

- Site Land Parcels Boundary
- Proposed Development Area
- Existing Road
- Proposed Roads
- North WEF Turbine Location
- Central WEF Turbine Location
- South WEF Turbine Location
- North WEF Substation (A)
- Central WEF Substation (B)
- South WEF Substation (C1)
- South WEF Substation (C2)
- North Grid Alternative 1
- North Grid Alternative 2
- Central Grid Alternative 1
- Central Grid Alternative 2
- South Grid Alternative 1
- South Grid Alternative 2
- South Grid Alternative 1&2

1:93,242 Scale @ A3

0 2 4 km

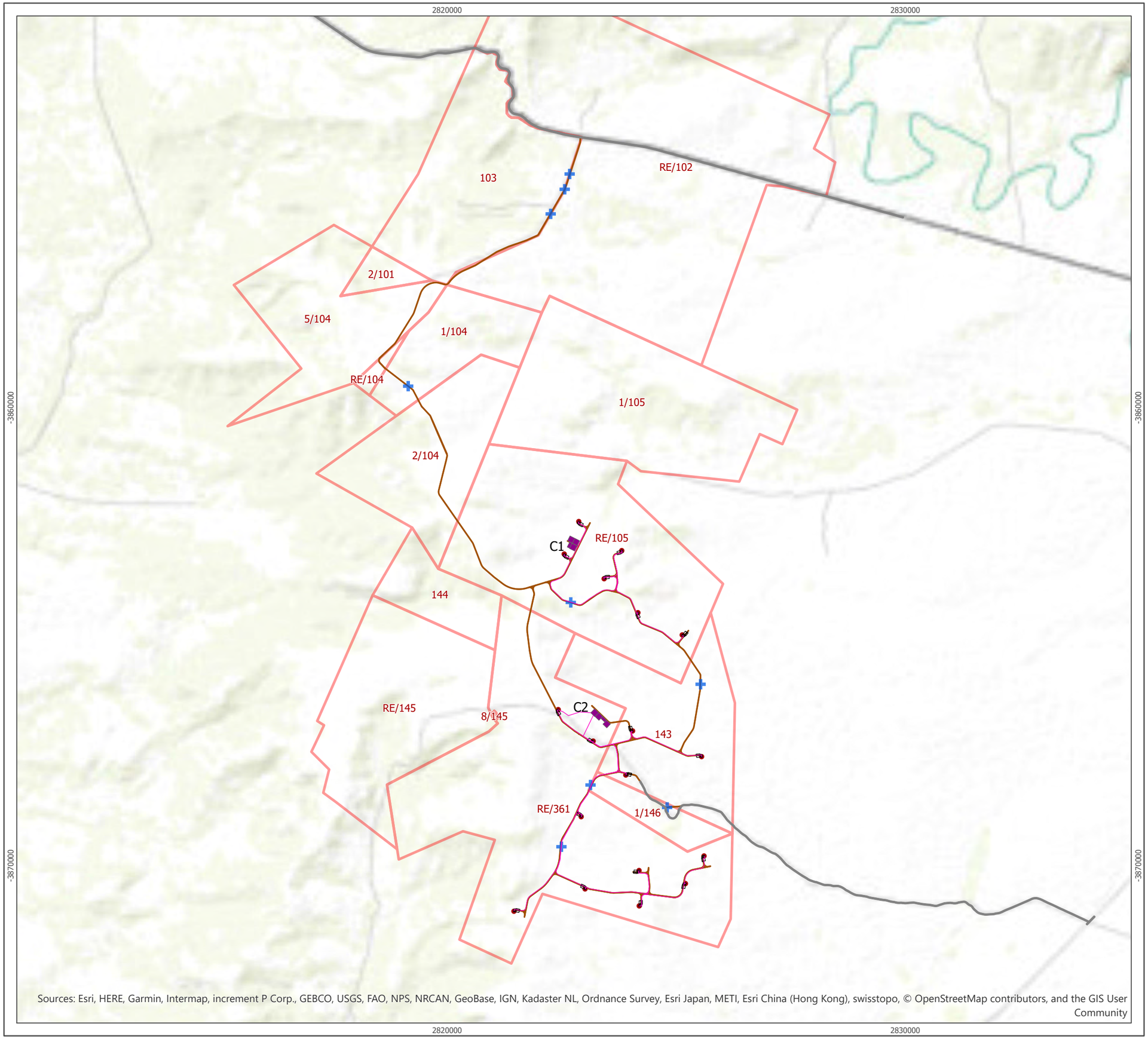
NORTH

Produced By: AA	Ref: 2780-REP-014
Checked By: SC	Date: 04/09/2018

Highlands WEFs Development Plan
Figure 7.1

Highlands South WEF Basic Assessment Report

Z:\GIS\Projects\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\South WEF Fig 7.1 Highlands WEFs Development Plan



ARCUS

- Land Parcel Boundary
- Existing Road
- South WEF Turbine Location
- South WEF Internal Cabling
- Substation A, O&M Complex & Laydown Area
- Hardstands & Laydown Areas
- Proposed Road
- Watercrossing

1:80,000 Scale @ A3

0 4 km

NORTH

Produced By: AA	Ref: 2780-REP-036
Checked By: SC	Date: 09/09/2018

Highlands South WEF
Development Plan
Figure 7.2

Highlands South WEF
Basic Assessment Report

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\South WEF Fig 7.2 Highlands South WEF Development Plan

The main settlements in the municipality are Somerset East, which serves as the administrative and commercial centre, Cookhouse and Pearson. The most significant roads passing through the area are the N10, R61, R63, and the R390. The administrative seat of the SBDM is currently located in the Nelson Mandela Bay Metro area, with disaster centres located throughout the district.

Access to the site from the north is at the farm Rietfontein via the R63, which effectively forms the site's northern boundary. The R63 is a tarred road linking Pearston to Somerset East (Photograph 7.1). Alternative site access is from the east via the MN50171 Waterford Road, which links up with the R63 approximately 6 km west of Somerset East (Photograph 7.2).

Photograph 7.1 : View along R63 looking towards Somerset East near turnoff to Rietfontein

Photograph 7.2: Waterford Road turn-off from the R63

An Eskom corridor (66 kV and 132 kV line) runs parallel to the R63 in the vicinity of the proposed development site and traverses the northernmost portion of the site approximately 200 m south of the R63 over a distance of approximately 3 km from east to west. The proposed development intends to connect to this grid infrastructure on site.

Apart from the road network, Eskom corridor and telecommunications infrastructure on Groot Bruintjieshoogte Mountain, there are no other significant service related infrastructure located in the study area.

The Proposed Development site lies at the eastern end of the Camdeboo Region and at the foot of the Bruitjieshoogte Mountain. Its land parcels cover an area of approximately 11 180 hectares. The area of interest for development within these land parcels is approximately 9000 hectares (The Proposed Development Area), but the development footprint of the Highlands South WEF will only occupy approximately 1% of this area. The Proposed Project is situated entirely within the Cookhouse REDZ (Figure 1.1).

The Proposed Development site is comprised of properties owned by two different land owners (Table 7.1, Figure 7.2). One of the owners is a commercial farmer farming while the other is National Government who leases the land to a farmer with a long lease (30-year) contract.

Table 7.1: Property Details of the Proposed Development Site (greyed out land parcels do not contain turbine positions for the Highlands South WEF)

Property Owner	Farm Portion	Size	SG Number
ZIRK JORDAAN FAMILY TRUST	Farm 102 Rietfontein Farm 102 – Portion 0 Remaining Extent	2443.50	C06600000000010200000
	Farm 104 Coetzees Fontein Farm 104 - Portion 0	25.54	C06600000000010400000

SA Government (Tenant: Simphewe & Linda Fani)	Farm 104 Coetzees Fontein Farm 104 - Portion 1	389.41	C06600000000010400001
	Farm 104 Coetzees Fontein Farm 104 - Portion 2	618.43	C06600000000010400002
	Farm 105 Doorn Rivier Farm 105 - Portion 0 Remaining Extent	1284.80	C06600000000010500000
	Farm 105 Doorn Rivier Farm 105 - Portion 1	1027.83	C06600000000010500001
	Farm 143 Nels Kraal Farm 143 – Portion 0	689.13	C06600000000014300000
	Farm 146 Kiepersol Farm 146 – Portion 1	125.91	C06600000000014600001
SA Government (Tenant: Tozi Nelani)	Farm 144 Nelskom Farm 144 - Portion 0 Remaining Extent	223.91	C06600000000014400000
	Farm 145 De Mullers Kraal Farm 145 – Portion 0	865.33	C06600000000014500000
	Farm 145 De Mullers Kraal Farm 145 – Portion 8	0.88	C06600000000014500008
HIGHLANDS TRUST	Farm 361 Highlands Farm 361 – Portion 0 Remaining Extent	1828.82	C06600000000036100000
G K W GEBOU TRUST	Farm 103 Spaarwater Farm 103 – Portion 0	854.39	C06600000000010300000
Jakkie Nel Trust	Farm 101 Lekker water Farm 101 – Portion 2	53.96	C06600000000010100002
	Farm 104 Coetzees Fontein Farm 104 – Portion 5	650.37	C06600000000010400005

The farm portions affected by turbines of the Highlands South WEF are discussed in more detail below.

7.2.1 Farm Doornrivier

The farm Doornrivier is owned by the South African Government and leased on a long term basis to the farmers Simphewe and Linda Fani. The farmstead is located on a farm portion outside of the Proposed Development site.

Doornrivier currently employs 4 tenured households and is used for livestock farming (Photograph 7.3). Labour is based elsewhere and transported in by the owner when required for farming operations (Photograph 7.4). No commercial hunting or tourism activities are taking place on the property.

The farm would be affected by six turbine positions and the substation C1 (Figure 7.2).

7.2.2 Farm Highlands

The farm Highlands is owned by Mr Bill Brown and used for extensive livestock grazing. Only one household resides on the farm in a supervisory capacity, with labour being brought in by the farmer when required (Photograph 7.5). Carrying capacity varies across the site from around 9-14 hectares per Large Stock Unit and is a function of grass-veld occurrence and type. The grazing resource is sufficiently productive to allow for year-round grazing. Properties are therefore typically stocked year-round. Cropping activities are very limited and limited to small plantings of fodder for own use near farmsteads.

The farm would be affected by nine turbine positions and the substation C2 (Figure 7.2).

Photograph 7.3: Thornveld on Farm Doornrivier

Photograph 7.4: Currently uninhabited farm house on Doornrivier.

Photograph 7.5: Labourer's house on Highlands Farm

7.3 Adjacent Properties

More recently, game farming has become an increasingly important activity in the area and is either combined with livestock farming or has in some cases replaced commercial livestock farming. Based on the findings of the sites visit the existing game farming operations are located within a continuous band within 5-10 km along the eastern boundary of the proposed development site. The game farming includes operations based on Buffelsfontein, Kamala Game Reserve, Kaalplaas (East Cape Safaris), Klipplaat (Side by Side Safaris), and possibly more (e.g. Driefontein). These operations focus primarily on the overseas trophy-hunting market and attract high-end visitors to the area (Nolte, pers. comm). The game farms also provide benefit to other sectors of the local economy in Somerset-East, including local suppliers (groceries, etc.), taxidermists and other operations.

Due to the broken topography and the extensive nature of farming activities, the settlement pattern in the study area is sparse and largely concentrated along major roads. Farms located in close proximity to the R63, Waterford Road or Klipplaat Road tend to be inhabited. Labourer's housing is typically located in the immediate periphery of farm yards. Large operations (such as Rietfontein) may have up to 10 resident farm worker households. More isolated farms are typically farmed as stock-posts inhabited by a small number of supervising staff. Most of the relevant owners own farming operations in other parts of the broader region, such as Graaff-Reinet, Cookhouse and Middleton, and deploy staff to the study area farms on an as-needed base. The study area is located sufficiently close to Somerset-East to enable owners to transport permanent and casual labour in and out on a daily basis.

Based on field interviews, permanent direct employment associated with site farms and those in the immediate vicinity, ranges from none or only supervisory staff, to 10 for a large commercial farming operation such as Rietfontein, and 24 for Kaalplaas (East Cape Safaris).

7.4 Wind Energy Facility (WEF) Components

The WEF will comprise components described below. It should be noted that as the design of the proposed development is not yet finalised, all dimensions are maximums as is required by the precautionary principle. The final design may include infrastructure which is of equal or less than dimensions to those stated below, but not greater or bigger than these dimensions.

7.4.1 Turbines

The proposed WEF will comprise of up 18 turbines.

At this stage, it is envisaged that the turbines will each have a capacity to generate between 3 and 5 MW of power. Each turbine will have a maximum height to blade tip of 200 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to 135 m and a rotor diameter of up to 150 m and a blade length of up to 75 m. The exact turbine model has not yet been selected and will be subject to competitive tendering after further wind analysis has been completed. The turbine model will depend upon the technical, commercial and site specific requirements.

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

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

Figure 7.2 indicates the preferred positions of the turbines for approval (The Final Mitigated Layout).

7.4.1.1 Turbine Power Output and Transformers

When operating, the rotational speed of the rotor is multiplied through the gearbox, which drives the generator. This produces a three-phase power output which is transferred from the generator to a transformer located either within the turbine or externally at ground level adjacent to each tower.

The turbine transformer converts the electrical output from the turbine to a higher voltage, 33 kilo volts (kV), for grid connection purposes. Stepping up the voltage helps to reduce electrical losses and in this case match the electrical system voltage for transmission to the grid. Power generated from the turbines is transmitted back to the site switching station via the underground site cables.

7.4.2 Electric Cabling and On-site Substations

Underground cabling will link the turbines to each other and the on-site substations. The electricity from the turbines will be transferred via a 33 kV electrical network to two on-site substations of up to 110 m by 100 m each. Where possible this will be underground but the feasibility of this will be confirmed as the design progresses and geotechnical studies are conducted. Detailed construction and trenching specifications will depend on the ground conditions encountered. Typically cables would be laid in a trench approximately 1 m deep and 0.5 m wide. To minimise ground disturbance, cables will be routed along the

side of the access tracks where practicable. The proposed cabling routing is presented in Figure 7.2.

The on-site substations will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid. The operations and maintenance (O&M) building adjacent to the on-site substation will be 50 m by 100 m including parking. A fence of up to 3 m height will surround the substation and O&M building.

7.4.2.1 Hard Stand Areas

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

A hardstanding area of up to 100 m by 50 m will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

The crane hard-standing will be reduced to 100 m x 30 m following construction in order to allow for maintenance should major components need replacing during the operational phase of the proposed development.

7.4.3 Ancillary Equipment

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

- Meteorological masts;
- Security fencing; and
- CCTV monitoring equipment.

7.4.3.1 Access

The turbine locations will be accessed through a network of unsealed roads which will be established across the WEF Site. The proposed road layout is presented in Figure 7.2. These access roads will be between 6 m and 12 m wide. A width of 12 m is required during the construction phase for curves in order to allow trucks to turn. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access roads will be upgraded and utilised where possible, as will existing watercourse crossings.

7.5 Description of the Construction Phase of the WEF

It is estimated that construction will take approximately 18 - 24 months subject to the final design of the WEF, weather and ground conditions, including time for testing and commissioning. The construction process will consist of the following principal activities:

- Site survey and preparation;
- Construction of site entrance, access roads and passing places;
- Enabling works to sections of the public roads to the WEF site (if required) to facilitate turbine delivery;
- Construction of the contractors' compound;
- Construction of crane pads;
- Construction of turbine foundations;
- Construction of substation building;
- Excavation of the cable trenches and cable laying;

- Delivery and erection of wind turbines;
- Erection of electricity overhead powerlines;
- Testing and commissioning of the wind turbines; and
- Rehabilitation.

It is possible for certain operations to be carried out concurrently, although predominantly in the order mentioned above. This would minimise the overall length of the construction programme. Construction would be phased such that the civil engineering works would be continuing on some parts of the site, whilst wind turbines are being erected elsewhere. Site rehabilitation will be programmed and carried out in order to allow the rehabilitation of disturbed areas as early as possible and in a progressive manner.

Based on the social specialists' assessment, the construction phase is likely to create approximately up to 200 to 250 employment opportunities, at its peak. Of this total, approximately 15% will be available to skilled personnel (engineers, technicians, management and supervisory), 30% to semi-skilled personnel (drivers, equipment operators) and 55% to low skilled personnel (construction labourers, security staff). The number and nature of employment opportunities will be refined as the development process progresses. These figures are based on other WEF developments, the exact number and nature of the employment opportunities will be defined during the bidding process, should the project be selected as a preferred bidder. These are requirements of the bidding process as defined by the DoE.

Water for construction purposes (e.g. mass earthworks and roads) will be transferred from the source to the point of use on the site via tanker. All storage of water will be below Water Use License Application (WULA) authorisation limits, i.e. 10 000 m^3. If this goes beyond this limit, a WULA will be submitted to the Department of Water Affairs.

7.5.1 Temporary Infrastructure

It is estimated that construction will take approximately 18 - 24 months subject to the final design of the WEF, weather and ground conditions, including time for testing and commissioning. The construction process will consist of the following principal activities:

- Site survey and preparation;
- Construction of site entrance, access roads and passing places;
- Enabling works to sections of the public roads to the WEF site (if required) to facilitate turbine delivery;
- Construction of the contractors' compound;
- Construction of crane pads;
- Construction of turbine foundations;
- Construction of substation building;
- Excavation of the cable trenches and cable laying;
- Delivery and erection of wind turbines;
- Erection of electricity overhead powerlines;
- Testing and commissioning of the wind turbines; and
- Rehabilitation.

It is possible for certain operations to be carried out concurrently, although predominantly in the order mentioned above. This would minimise the overall length of the construction programme. Construction would be phased such that the civil engineering works would be continuing on some parts of the site, whilst wind turbines are being erected elsewhere. Site rehabilitation will be programmed and carried out in order to allow the rehabilitation of disturbed areas as early as possible and in a progressive manner.

Based on the social specialists' assessment, the construction phase is likely to create approximately up to 200 to 250 employment opportunities, at its peak. Of this total,

approximately 15% will be available to skilled personnel (engineers, technicians, management and supervisory), 30% to semi-skilled personnel (drivers, equipment operators) and 55% to low skilled personnel (construction labourers, security staff). The number and nature of employment opportunities will be refined as the development process progresses. These figures are based on other WEF developments, the exact number and nature of the employment opportunities will be defined during the bidding process, should the project be selected as a preferred bidder. These are requirements of the bidding process as defined by the DoE.

7.5.2 Water Supply for Construction

The estimated total water demand for construction is approximately 200 kL/day, not exceeding 40,000 kl total per annum. It is anticipated that this will either be will be supplied via 15 kL water trucks to the various construction areas, or be abstracted from boreholes, in which case an application for authorisation will be made. All storage of water will be below Water Use License Application (WULA) authorisation limits, i.e. 10 000 m^3. If this goes beyond this limit, a WULA will be submitted to the Department of Water Affairs.

7.6 Description of the Operational Phase of the WEF

The proposed development will be designed to have an operational life of at least 25 years as set out in the current REIPPPP by the DoE. There is the possibility to further expand the lifetime by an extra 25 years. The only development related activities on-site will be routine servicing and unscheduled maintenance, as detailed in the sections below.

Based on the developer's experience from other WEFs, the operational phase is likely to create approximately 20 permanent employment opportunities in addition to the employment opportunities across the other phases. Of this total, approximately 70% will be low and medium-skilled and 30% will be high skilled positions. The number and nature of employment opportunities will be refined as the development process progresses. The figures provided here are early estimates.

7.6.1 Routine Servicing

Wind turbine operations will be overseen by suitably qualified local contractors who will visit the site regularly to carry out maintenance. The following turbine maintenance will be carried out along with any other maintenance required by the manufacturer's specifications:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes; and
- Blade inspections.

Routine scheduled servicing will likely take place every three months with a main service likely to occur at twelve-monthly intervals. Servicing will include the performance of tasks such as maintaining bolts to the required torque, adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. In addition, oil sampling and testing from the main gearbox will be required once every year and oil and other consumables replaced at regular intervals. Technicians are on site daily to ensure that the turbines are operating safely and at their maximum efficiency.

Site tracks will be maintained in good order. Safe access will be maintained all year round.

The turbines are monitored 24 hours a day real-time via a supervisory control and data acquisition (SCADA) system.

Unscheduled Maintenance

Unscheduled maintenance associated with unforeseen events will be dealt with on an individual basis. In the unlikely event of a main component failure cranes may be mobilised to site to carry out repairs and/or replacement works.

7.7 Description of the Decommissioning Phase of the WEF

The Highlands South WEF will either operate for a minimum of 25 years (duration of PPA with Eskom) and then be decommissioned and the site rehabilitated, or should a new PPA be secured, the project will be repowered to continue its operation for up to a further 25 years. It is impossible at this stage to anticipate the kind of advanced wind technology that will be available in the distant future.

Repowering would not be undertaken under this application or resulting Environmental Authorization, and would be subject to a new application at the time. In the event that the technology changes significantly, the operator will be required to engage with DEA to understand what additional requirements might need to be fulfilled in order to be authorised to use more advanced technology on the site.

In the event of decommissioning, typically, all above ground equipment will be dismantled and removed from the site. Cables and the turbine foundations will be cut off below ground level and covered with topsoil. Access tracks will be left for use by the landowners, or if appropriate, covered with topsoil or reduced in width.

This approach is considered to be best practice environmentally and less damaging than seeking to remove all foundations, underground cables in their entirety. Decommissioning will take account of the environmental legislation and technology available at the time of decommissioning.

7.8 Transportation of Wind Turbine Components to Site

Ngqura Port is the preferred port for particularly large equipment and machinery for the WEF development. The route from Ngqura Harbour travels north along Neptune Road, east along the R102 (Daniel Pienaar Street). Some abnormal load vehicles may be able to use the cloverleaf on-ramp to gain access to the N2, but abnormally long vehicles (carrying wind turbine blades) would need to pass through the interchange and turn right at the T-intersection at the end of Daniel Pienaar St and travel south to the end of Daniel Pienaar Street and turn south towards the interchange on the N2 and take the N2 eastbound On-Ramp. The route continues east along the N2 and takes the N10 northbound on-ramp towards Cookhouse. At Cookhouse the route follows the R63 westbound towards and through Somerset East to the site to the west of Somerset East.

A complete transportation management plan will be undertaken prior to construction, should the project be awarded preferred bidder status.

8 GEOLOGY, SOILS AND AGRICULTURE

8.1 Description of the Baseline Environment

8.1.1 Climate and Water availability

Rainfall for the study area is given as 436 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). Rainfall and resultant moisture availability is insufficient to support viable, rainfed cultivation of crops. There are some small farm dams across the project area, with some very small patches of irrigated cultivation. Sufficient irrigation water is not available for any significant area of irrigated land.

8.1.2 Terrain, topography and drainage

The project is located across hilly terrain on the edge of a plateau that drops off steeply to the west. The highest part of the plateau is along the crest of the hills, near the western edge, that reaches an altitude of just over 1100 metres. The project area drops gradually eastwards onto the plateau to an altitude of around 900 metres (Figure 8.1). There is a wide range of slopes across the hilly terrain. There are a number of eastward flowing, non-perennial water courses across the project area. The underlying geology of the project area is mudstone and sandstone of the Beaufort Group of the Karoo Supergroup.

8.1.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The wind farm infrastructure is proposed almost entirely on a single land type, Fc168, although a very small part if it extends into a second land type, Db169 (Figure 8.2). Soils of both land types are very similar. They are predominantly very shallow, clay-rich, reasonably drained soils on underlying rock. Dominant soil forms are Glenrosa and Swartland. A smaller proportion of deeper Oakleaf soils also occur. A summary detailing soil data for the land types is provided in the Specialist Report (Volume II). The field investigation confirmed that the dominant soil types are shallow soils on underlying rock. The shallow, clay-rich soils are susceptible to erosion.

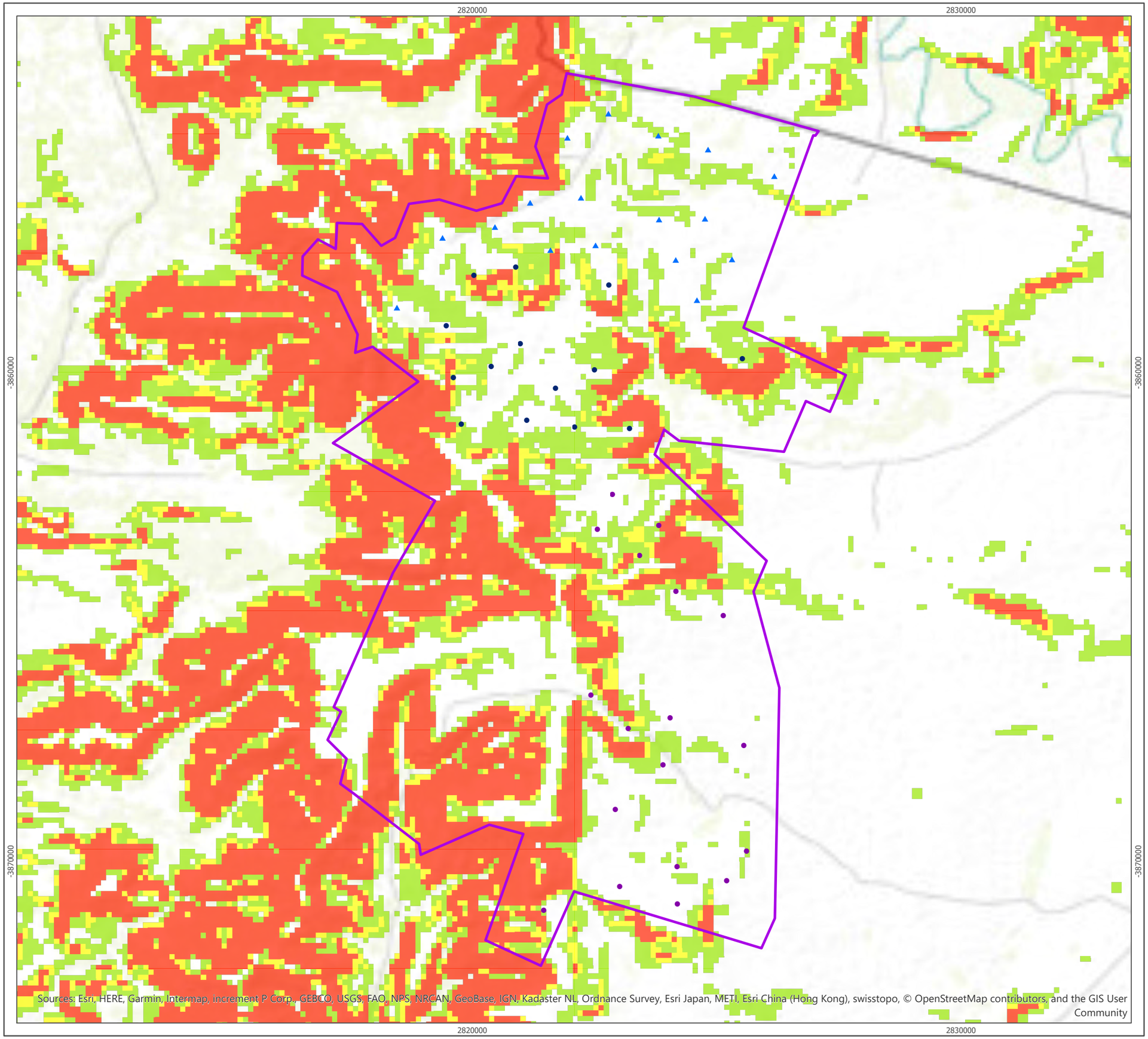
8.1.4 Agricultural Capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land.

The Proposed Development Area is classified with predominant land capability evaluation values of 5-6 (Table 8.1). The land capability of the more rugged, hilly terrain, drops all the way down to a value of 1 in places. The land capability of the Proposed Development Area is therefore classified as being unsuitable for the production of cultivated crops. The land capability is predominantly limited by the low climatic moisture availability and the shallow soils. The farmers report a stocking rate of 1 large stock unit per 10 hectares.

Table 8.1: Details of the 2017 Land Capability classification for South Africa

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High



ARCUS

Proposed Development Area

Final Mitigated Layout

- North WEF Turbine Location
- Central WEF Turbine Location
- South WEF Turbine Location

Slope (%)

- 8 - 12
- 12 - 14
- >14

1:75,000 Scale @ A3

0 1.5 3 km

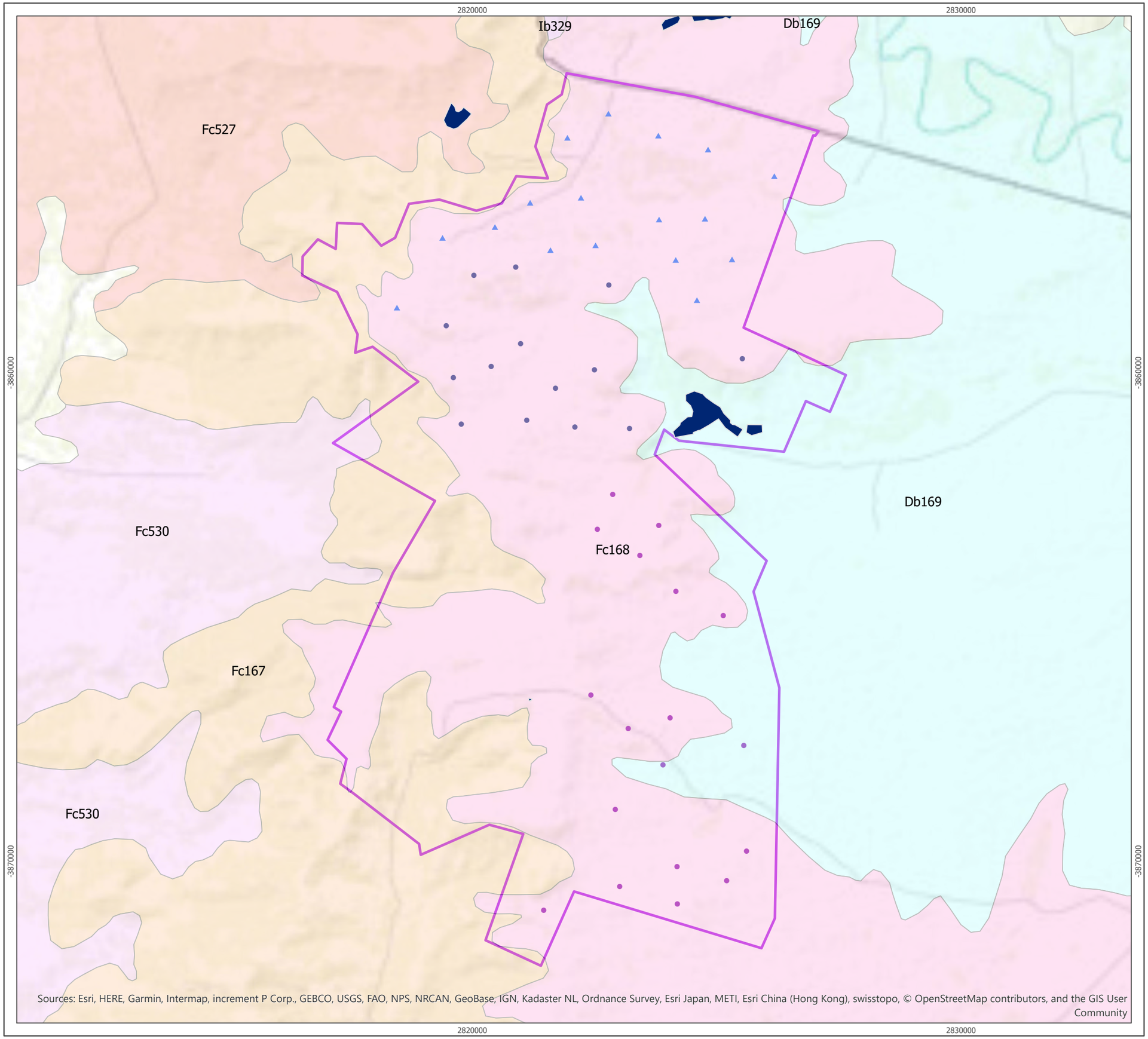
NORTH

Produced By: AA	Ref: 2780-REP-045
Checked By: SC	Date: 12/09/2018

Slope Analysis Map
Figure 8.1

Highlands WEFs
Basic Assessment Report

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\North WEF Fig 8.1 Slope Analysis Map



ARCUS

Proposed Development Area

Final Mitigated Layout

- North WEF Turbine Location
- Central WEF Turbine Location
- South WEF Turbine Location
- High Agricultural Sensitivity

Land Type

- Db169
- Fc167
- Fc168
- Fc527
- Fc530
- Ib329

1:75,000 Scale @ A3

0 1.5 3 km

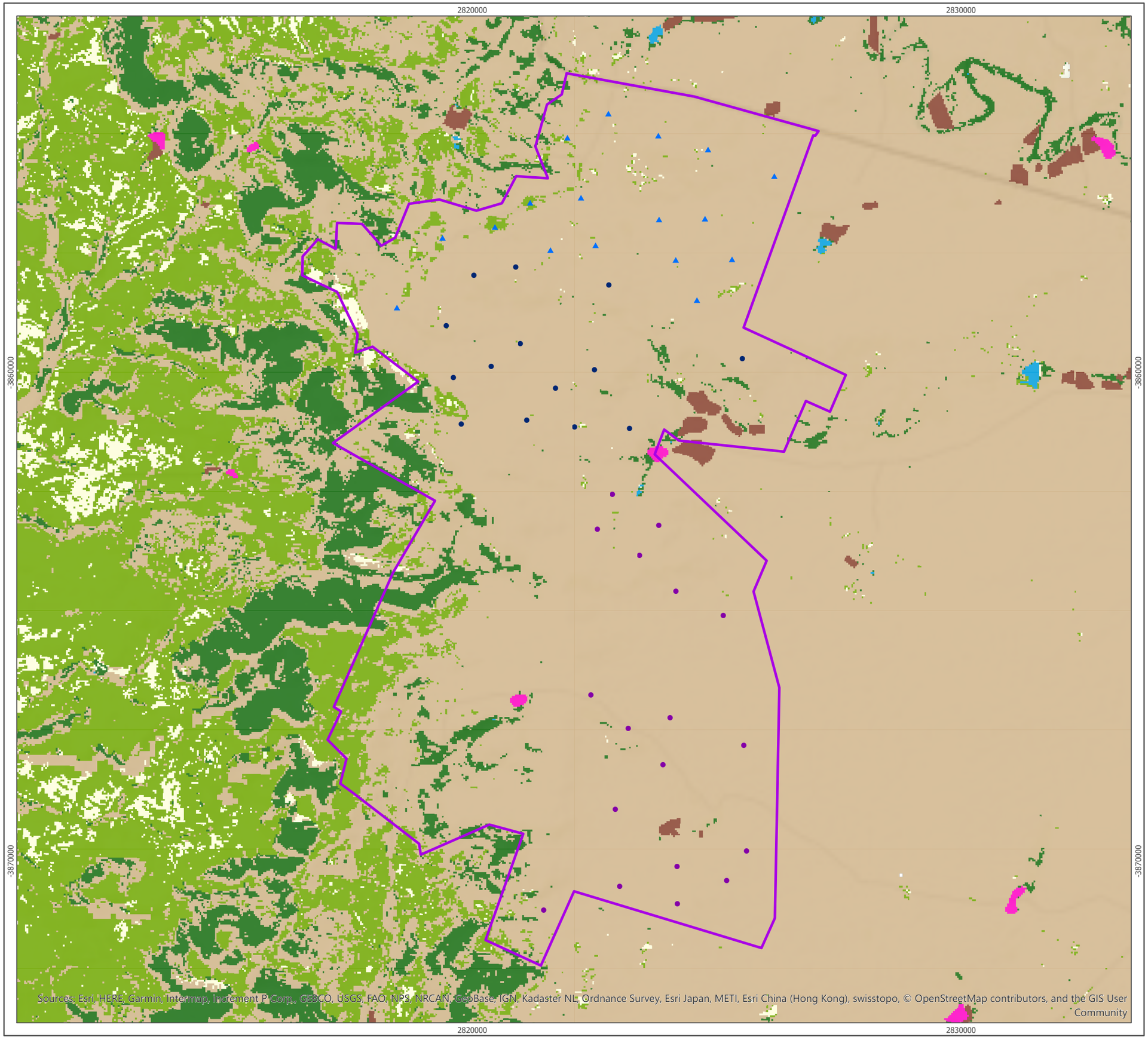
NORTH

Produced By: AA	Ref: 2780-REP-045
Checked By: SC	Date: 12/09/2018

Land Types and Agricultural Sensitivity
Figure 8.2

Highlands WEFs
Basic Assessment Report

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\North WEF Fig 8.2 Land Types and Agricultural Sensitivity1



ARCUS

Proposed Development Area

Final Mitigated Layout

- North WEF Turbine Location
- Central WEF Turbine Location
- South WEF Turbine Location

SA Landcover 2013-14

- Waterbody
- Thicket / Bush
- Grassland
- Shrubland
- Cultivated
- Erosion (donga); Bare none vegetated

1:75,000 Scale @ A3

0 1.5 3 km

NORTH

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Land Use
Figure 8.3

Highlands WEFs
Basic Assessment Report

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\North WEF Fig 8.3 Land Use

15	

8.1.5 Land use and Status

The Proposed Development Site is located in a sheep farming area. The only agricultural infrastructure within the proposed footprint area are small farm dams, wind pumps, stock watering points and fencing surrounding grazing camps. Three farmsteads lie within the Proposed Development Site but fall outside of the proposed footprint area. Access to the proposed developments is by way of farm access roads that will require upgrading. The Proposed Development Area is almost entirely grazed, natural veld (Figure 8.3). There are some areas of minor erosion but there are no areas of very significant erosion or other significant land degradation across the study area. Due to both the climate and soil limitations, the land is not suited for cultivation and grazing is the only viable agricultural land use. Small patches of previously cultivated land were designated as having high agricultural sensitivity, and should be avoided by the footprint of the development (Figure 8.2).

8.2 Assessment of Potential Impacts

The significance of an impact is a direct function of the degree to which that impact will affect current or future agricultural production.

The components of the project that can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total, direct, physical footprint of the proposed project including all roads;
- Construction activities that may disturb the soil profile and vegetation, for example for levelling, excavations, etc.

Impact Phase: Construction, Operation and Decommissioning Phase							
Impact description: Loss of agricultural land use Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?	Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.						
Will impact cause irreplaceable loss or resources?	No, because only a very small amount of grazing land is lost and such land is not a scarce resource.						
Can impact be avoided, managed or mitigated?	Yes, to some extent.						
Mitigation measures: • The avoidance of high sensitivity areas by the design layout, and this has already been implemented during the design phase.							

Impact Phase: Construction, Operation and Decommissioning Phase
Impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance,

vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	M	Negative	M	M	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?	Yes, only to some extent and only with substantial inputs over a significant period of time.						
Will impact cause irreplaceable loss or resources?	No, because only a very small amount of grazing land is lost and such land is not a scarce resource.						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Impact Phase: Operational Phase

Impact description: Generation of additional land use income

Income will be generated by the farming enterprises through the lease of the land to the energy facility. This will provide the farming enterprises with increased cash flow and rural livelihood, and thereby improve their financial sustainability.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Positive	M	H	H
With Mitigation	L	M	L	Positive	M	H	H
Can the impact be reversed?	Yes, as soon as income generation ceases at the end of the project.						
Will impact cause irreplaceable loss or resources?	No, not at all.						
Can impact be avoided, managed or mitigated?	No						

Mitigation measures:

None

The proposed development is located on land zoned and used for agriculture (grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of low agricultural potential and only suitable for grazing.

The significance of all agricultural impacts is low due to two important factors. Firstly, the actual footprint of disturbance of the wind farm (including associated infrastructure and

roads) is very small in relation to the available grazing land on the effected farm portions. All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project. Secondly, the proposed site is on land of limited agricultural potential that is only viable for grazing. These two factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

Small patches of previously cultivated land were designated as having high agricultural sensitivity, and should be avoided by the footprint of the development. The Final Mitigated development layout does avoid all of these areas.

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

9 FRESHWATER AND WETLANDS

9.1 Description of the Baseline Environment

The proposed development/s occur within the following catchments within the Great Karoo and Drought Corridor Ecoregions both located within the Mzimvubu-Tsitsikamma Water Management Area (Figure 9.1).

- Q80D – Klein Vis catchment
- Q80F – Brak River catchment
- N30B – Slotspruit, Klipplaat and Voël Rivers catchments

These catchments are characterised by perennial water courses and drainage lines associated with the mainstem systems listed above, and most flow only after high rainfall events. The Klein Vis (Little Fish) does however form part of the Fish-Sundays River Canal scheme that receives a constant supply of water from the Gariep Dam.

The Eastern Cape Biodiversity Conservation Plan identifies the subquaternary catchments associated with the Voël River as an Aquatic Critical Biodiversity Area Type 2 (Figure 9.2). This would however only be affected by two turbines and a small portion of a new road.

According to the National Freshwater Ecosystems Priority Area (NFEPA) wetland data, no natural wetlands could occur within the study area. The remaining waterbodies are artificial or man-made systems as shown in Figure 9.3. This was confirmed during the site visits and analysis of the various aerial images as well as supported by the updated National Wetland Inventory Data.

Figure 9.3 indicates the watercourses observed within the site. Any activities within these areas or the 32 m buffer (or the 1:100 floodline, whichever is the greatest) will require a Water Use License.

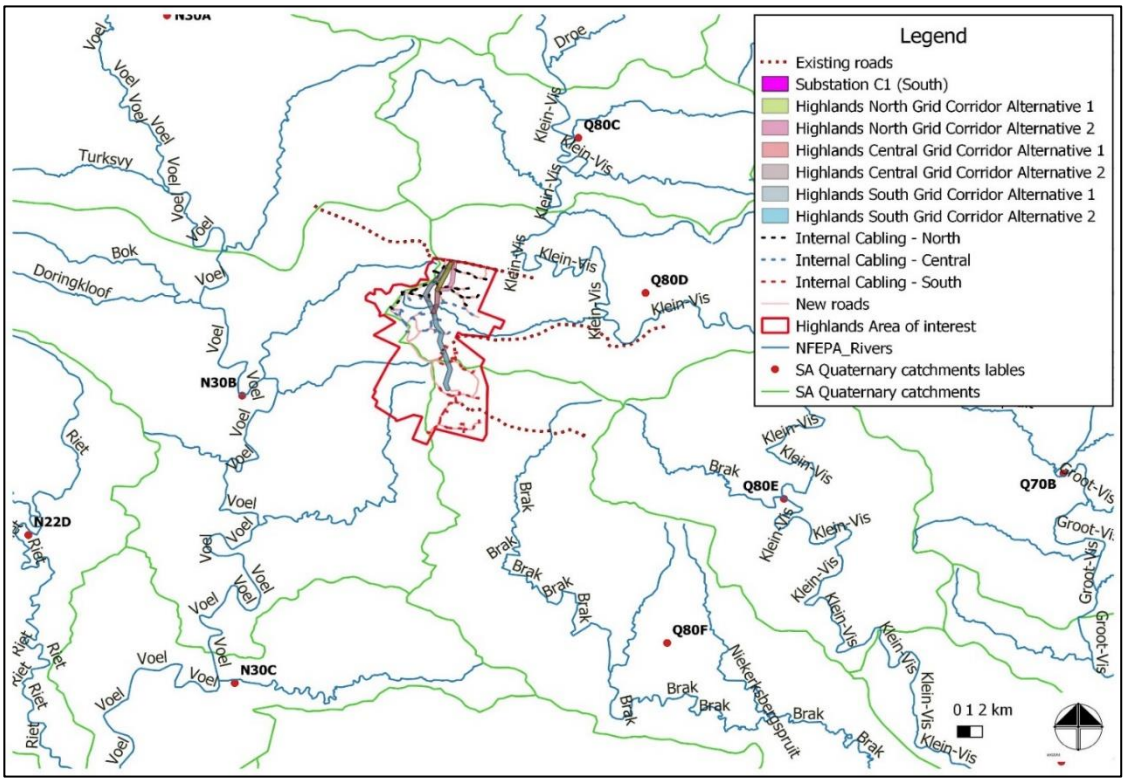


Figure 9.1: Quaternary Catchments and Mainstem Rivers within the Region

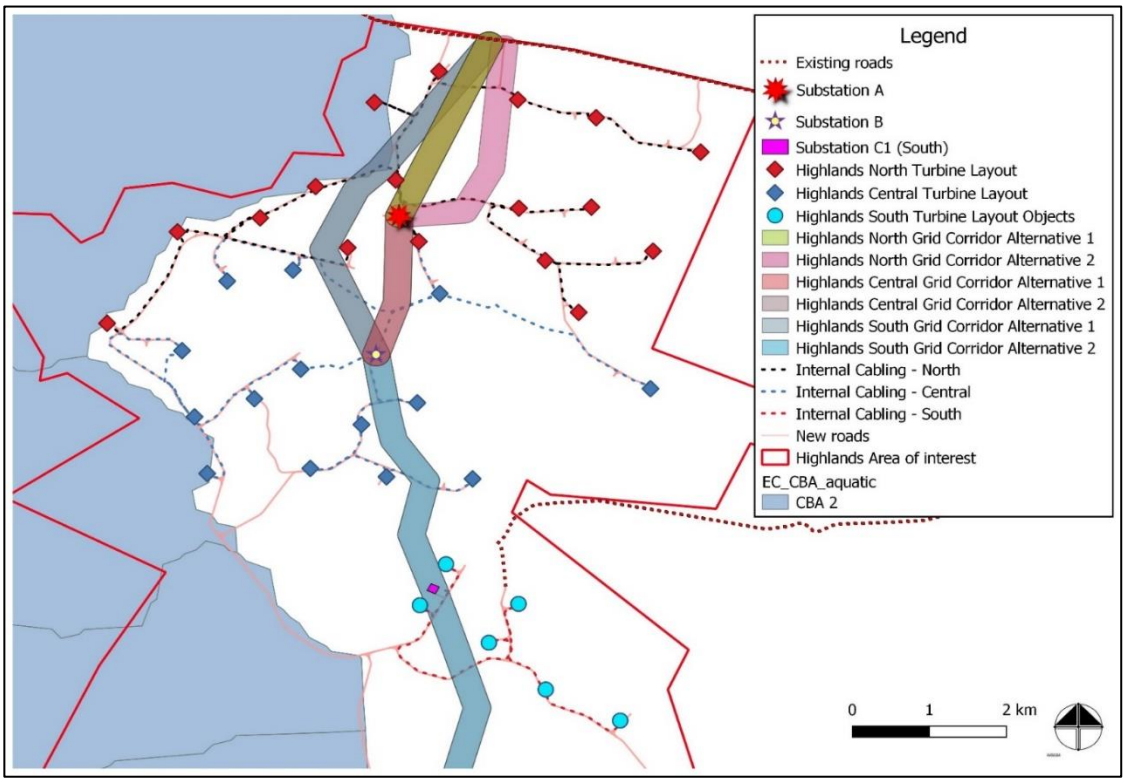


Figure 9.2: Aquatic Critical Biodiversity Areas according to the Eastern Cape Biodiversity Conservation Plan

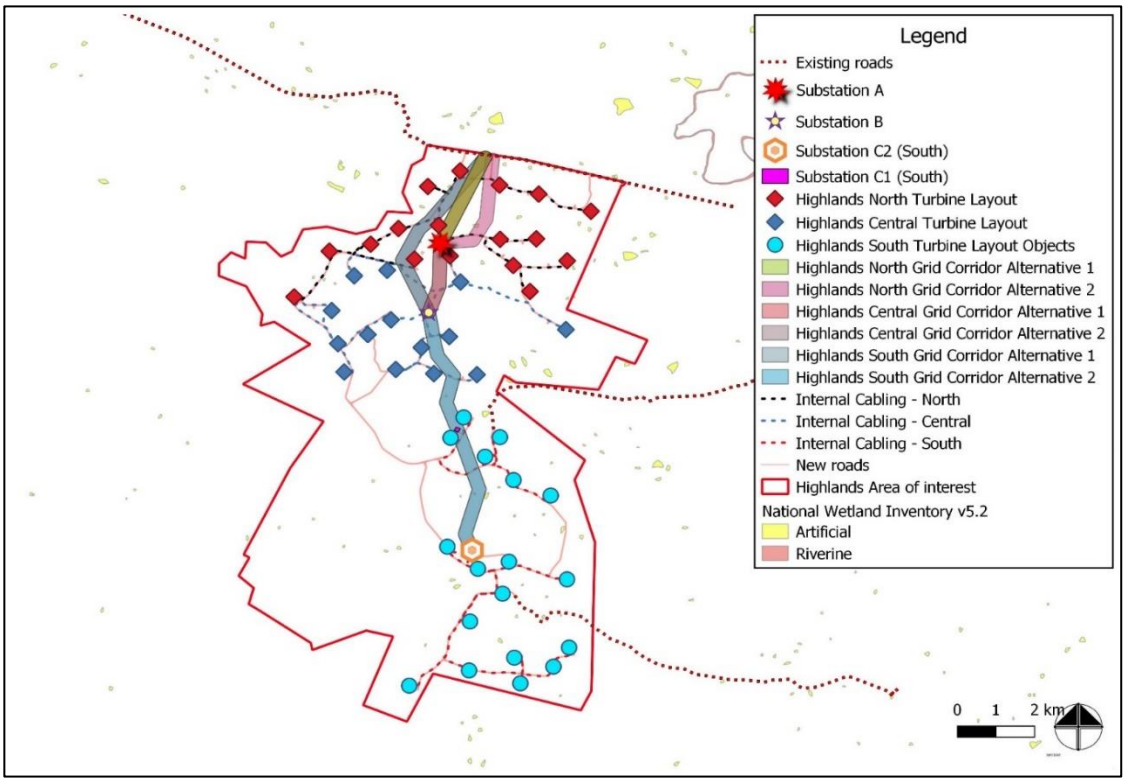


Figure 9.3: Confirmed waterbodies according to the National Wetland Inventory (all artificial)

9.1.1 Present Ecological State and Conservation Importance

The Present Ecological State of a river represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The Present Ecological State scores (PES) for the drainage lines and the rivers in the study area were rated as follows:

Sub quaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
7728	C	Moderate	Moderate
7787	C	Moderate	Moderate
7725	B	High	Moderate
7850	B	High	Moderate
7884	B	High	Moderate
7867	B	High	Moderate

It is thus evident that the study area systems are largely functional and or have limited impacts as a result of current land use practices. This was confirmed for several of the affected reaches located within the development footprint and in particular the areas that would be crossed by future access roads (Figure 9.4).

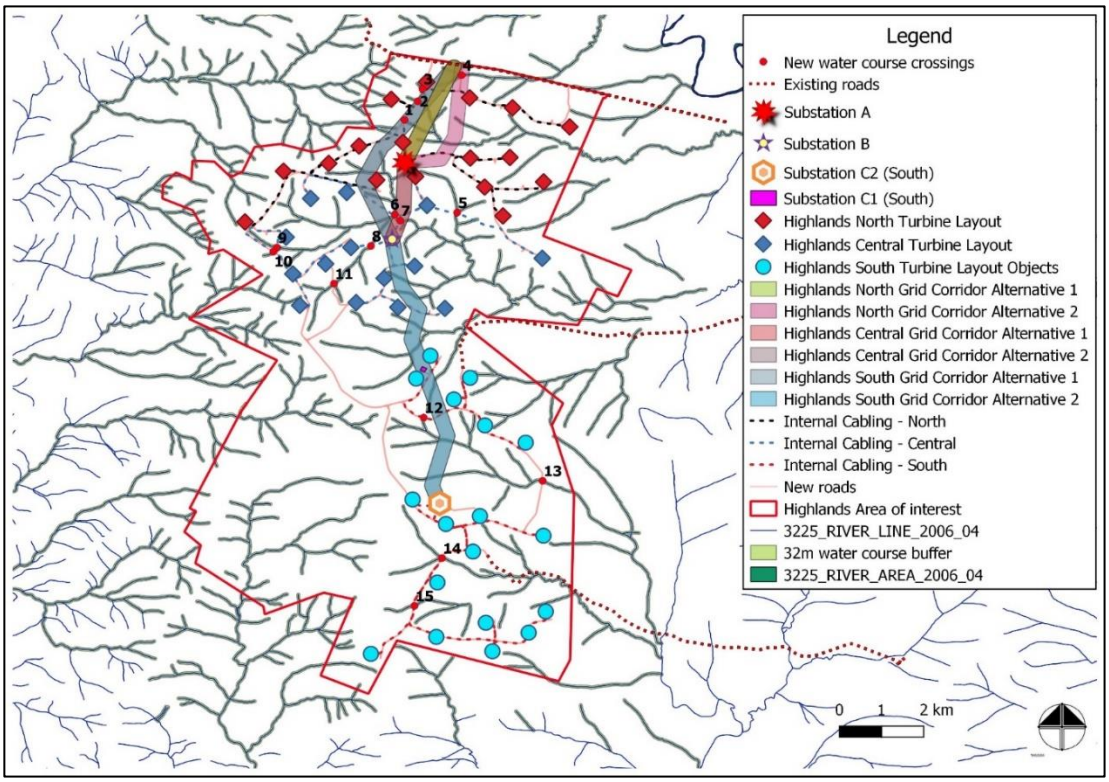


Figure 9.4: Watercourses and rivers within and adjacent to the study area

9.2 Assessment of Potential Impacts

The following impacts were not assessed as the factors were not present within the study area aquatic ecosystems:

- Loss of aquatic species of special concern, and
- Wetland loss as no natural wetlands were observed in close proximity to any of the proposed infrastructure (i.e. within 500 m of the roads layout).

The following direct and indirect impacts were assessed with regard the riparian areas and water courses:

- Impact 1: Loss of riparian systems and water courses;
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function;
- Impact 3: Increase in sedimentation and erosion; and
- Impact 4: Potential impact on localised surface water quality

Impact Phase: Construction Phase							
Impact description: Loss of riparian systems and water courses during the construction phase The physical removal of the narrow strips of riparian zones and disturbance of any watercourses by the road crossings only, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining catchment would remain intact, while the significant structures (e.g. turbines and hard standing areas) have been placed well outside of these areas.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			Yes				

Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes
Mitigation measures: • Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (crossing should have a small footprint). • No vehicles to refuel or be maintained within drainage lines/ riparian vegetation. • Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.	
Residual Impact	Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.

Impact Phase: Operational Phase							
Impact description: Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or new road crossings on riparian form and function during the operational phase							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities. This is particularly important due to the levels of erosion already observed within the affected catchments.							
Residual Impact	Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.						

Impact Phase: Construction and Operational Phase							
Impact description: Increase in sedimentation and erosion within the development footprint during the construction phase and to a lesser degree the operational phase							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						

Can impact be avoided, managed or mitigated?	Yes
Mitigation measures: • Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.	
Residual Impact	During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream.

Impact Phase: Construction and Operational Phase							
Impact description: Impact on localized surface water quality mainly during the construction phase During construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • Strict use and management of all hazardous materials used on site. • Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.). • Containment of all contaminated water by means of careful run-off management on the development site. • Strict control over the behaviour of construction workers. • Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced. • Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.							
Residual Impact	Residual impacts will be negligible after appropriate mitigation.						

9.3 Conclusion

The proposed development would have a limited impact on the aquatic environment as all large structures will avoid the delineated natural systems, with a limited number of new water course crossings, i.e. the layout makes use of any of the existing roads, as far as practicable. Thus, no objection to the development taking place is made.

Figure 9.2 indicates the affected water courses and those that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts, while also reducing the height of the bridge footings (culvert bases) to reinstate natural water course levels. This was mostly observed along the district roads within the area, but is in line with other projects within the region.

Furthermore, an application for the abstraction of groundwater (Section 21a) and the temporary storage of domestic waste (Section 21g - conservancy tanks, if exceeding 10 000 cm^3) may be required.

10 FLORA AND TERRESTRIAL FAUNA

10.1 Description of the Baseline Environment

10.1.1 Vegetation Patterns

There are three vegetation types within the study area. The lower lying valleys and low hills in the east consist of Camdebo Escarpment Thicket, while the higher lying areas and east-facing slopes consist of Bedford Dry Grassland and the major drainage systems are dominated by the Southern Karoo Riviere vegetation type. The majority of the development footprint is located within the Bedford Dry Grassland vegetation type. Each of these vegetation types is described below and more fully in the Specialist Report (Volume II) and illustrated as they occur within the site, showing the range of habitats and compositional variation evident within the site, showing the range of habitats and compositional variation evident within the study area.

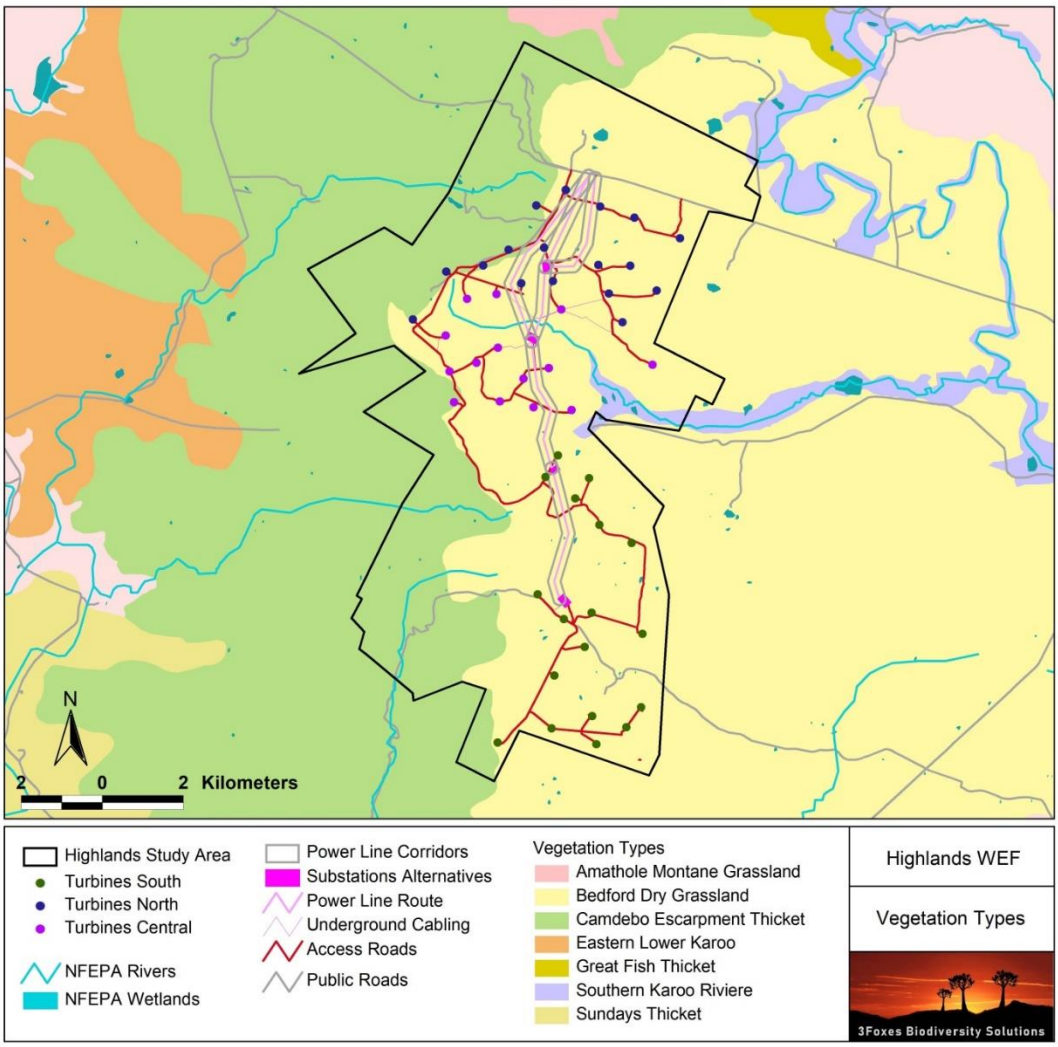


Figure 10.1: Vegetation Types

The majority of drainage lines within the site are relatively small and not well developed, although there are some larger systems with riparian vegetation and a well-developed tree layer.

10.1.2 Faunal Communities

Mammals

Approximately 50 mammal species potentially occur at the site (see Appendix 2 of the Specialist Report, Volume II). Due to the diversity of habitats available, which includes rocky uplands and ridges, drainage lines and wetlands areas, as well as open plains and low shrublands, the majority of species with a distribution that includes the site are likely to be present in at least part of the broader site. Important habitats for mammals at the site include the drainage lines, thicket valleys in the west of the site, forest patches in the north and rocky outcrops along the mountain escarpment.

Overall, long-term impacts on mammals are likely to be restricted largely to habitat loss equivalent to approximately the footprint of the development. Most mammals appear to become habituated to wind turbines and do not avoid them to a significant degree. There may however be some species which are more wary of the turbines and which would experience a greater degree of habitat loss. Long-term impacts on mammals are likely to be of moderate to low intensity and of local significance only.

Reptiles

There is a wide range of habitats for reptiles present at the site, including rocky uplands and cliffs, open flat and lowlands and densely vegetated areas. As a result the site is likely to have a relatively rich reptile fauna which is potentially composed of 4 tortoise species, 12 snakes, 16 lizard species and skinks, 1 chameleon, 1 terrapin and 4 gecko species. Species observed at the site include Rock Monitor, Red-lipped Snake, Western Rock Skink, Red-sided Skink, Leopard Tortoise, Ground Agama and Rock Agama.

Important habitats for reptiles at the site include the rocky outcrops along the edge of the escarpment, densely vegetated drainage lines and thicket patches. As these features are largely outside of the development footprint, impact on important reptiles habitats would be low. In general, the major impact associated with the development would be habitat loss and fragmentation for reptiles, with the potential for increased levels of predation being a secondary impact which may occur as a result of vegetation clearing for roads and turbine pads. There are not likely to be any reptiles which are specifically restricted to the target ridges and which would be particularly vulnerable to impact as a result.

Amphibians

Although there are no perennial rivers within the site, there are numerous earth dams that hold water on a near-perennial basis as well as sheltered pools along some of the drainage lines that are likely used by the amphibians for breeding purposes. No listed species or species with a restricted distribution are known from the area. As the drainage lines and farm dams would not be directly impacted by the development, impact on important amphibian habitats would be relatively low. The higher-lying target ridges are not likely to have many amphibian species present on account of the general lack of water and suitable habitat features.

Direct impacts on amphibians at the site are likely to be fairly low. Amphibians are however highly sensitive to pollutants and the large amount of construction machinery and materials present at the site during the construction phase would pose a risk to amphibians should any spills occur.

10.1.3 Critical Biodiversity Areas and Broad Scale Ecological Processes

A large proportion of the Proposed Development Site is located within a Tier 2 CBA. However only one turbine of the Highlands South WEF is proposed within the Tier 2 CBA. The CBA 2 status of the area indicates that the CBA which includes the site is related to the maintenance of ecosystem processes and not to protect biodiversity pattern as the area does not have any features of known high significance in this regard (i.e. rare habitats or an abundance of localized or endangered species). The underlying information associated with the CBA indicates that the CBA which includes the study area is designed as part of a corridor to maintain broad-scale ecological connectivity. Given the large scale of the CBA and the relatively small proportion of the CBA that falls within the development footprint, it is not likely that the development would compromise the overall functioning of the CBA as an ecological corridor.

The site also falls partly within a NPAES Focus Area, indicating that the area has been identified as a potential target for protected area expansion. The affected Camdebo Escarpment Focus area is over 421 000 ha in extent and the loss of less than 10 000 ha from this focus area is not considered highly significant.

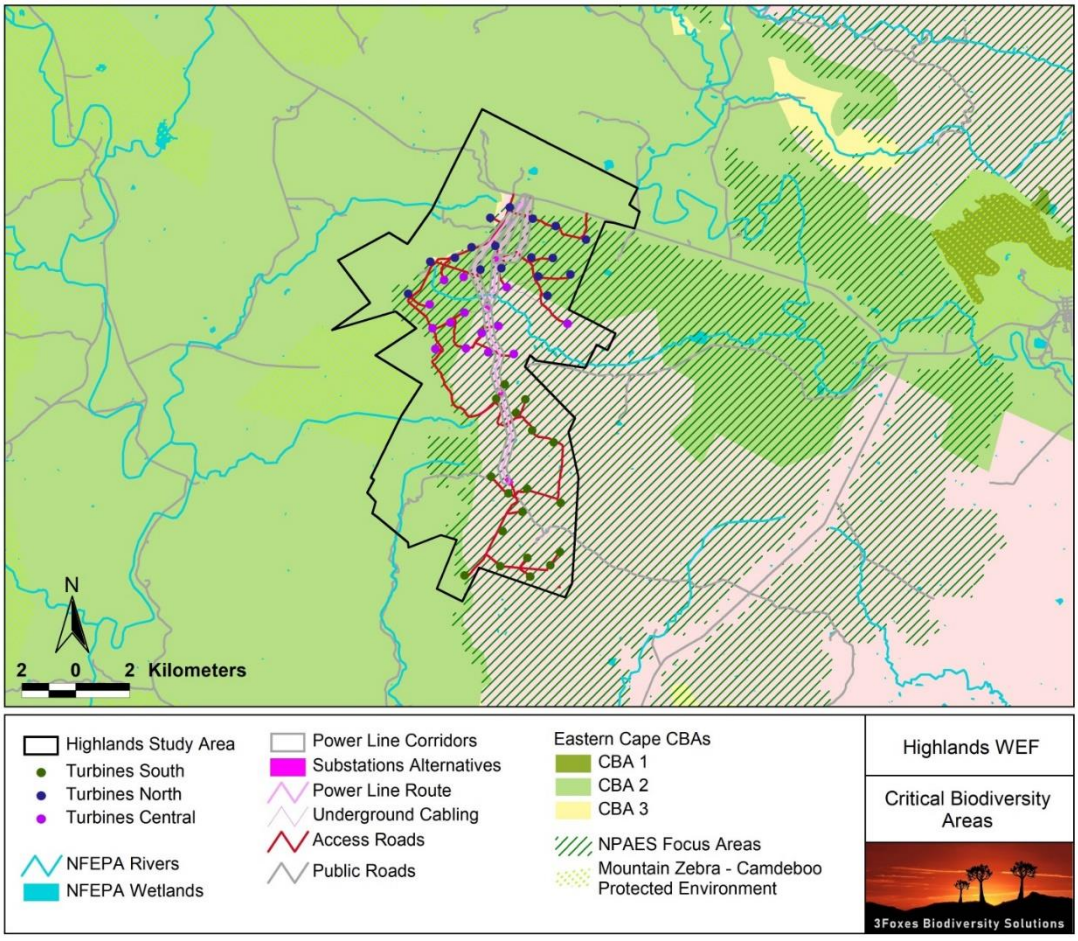


Figure 10.2: Critical Biodiversity Areas and NPAES focus areas

10.1.4 Site Sensitivity Assessment

The ecological sensitivity map for the Proposed Development Site is illustrated below in Figure 10.3. The western valleys and slopes along the edge of the escarpment which are dominated by thicket vegetation are considered to be high sensitivity as are the drainage

lines which mostly drain in an easterly direction. The target ridges consist largely of open grassland with a low density of species of conservation concern. These areas are considered to be low to moderate sensitivity and are considered suitable targets for development. The higher lying ridges especially in the central and southern parts of the site are not within the development footprint and these areas are considered to have greater ecological value than the lower lying hills to the east where the majority of the development is concentrated.

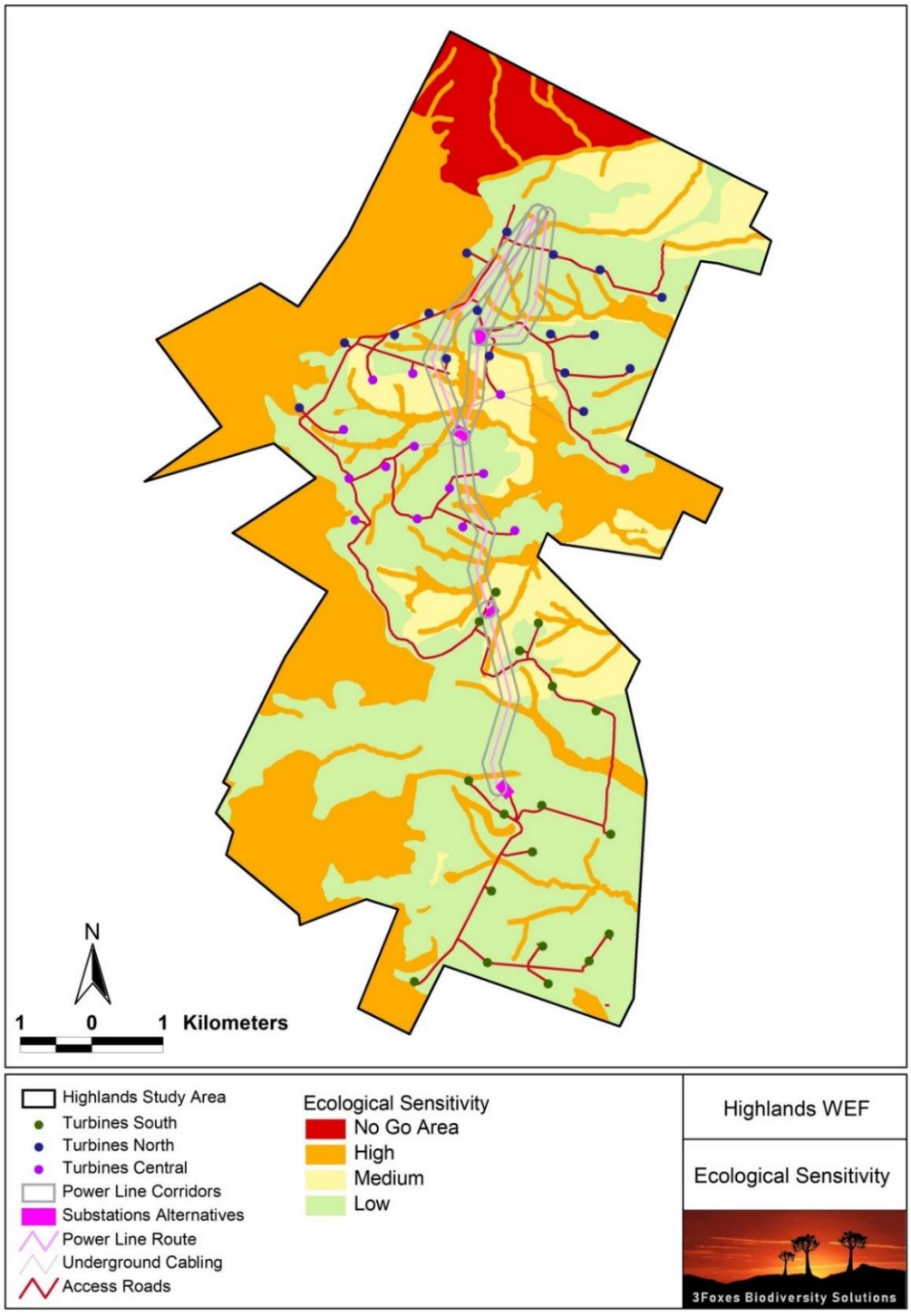


Figure 10.3: Ecological Sensitivity

10.2 Assessment of Potential Impacts

Impact Phase: Construction Phase							
Impact description: Impact on vegetation and listed plant species due to transformation within the development footprint							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	M	M	Negative	M	H	H
Can the impact be reversed?	No, transformation is a necessary outcome of the development and will largely persist for the lifetime of the development and sometime thereafter. Some residual impact will remain even after decommissioning and rehabilitation.						
Will impact cause irreplaceable loss or resources?	No, no critical or rare habitats are within the development footprint.						
Can impact be avoided, managed or mitigated?	To some extent, through avoidance of sensitive areas, but some residual impact is likely.						
Mitigation measures: • Preconstruction walk-through of the approved development footprint to ensure that sensitive habitats and species are avoided where possible. • Search and Rescue of species of conservation concern should be conducted prior to clearing activities. • Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas. • Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development. • The exact routing of the roads should be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-through of the facility. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area.							
Residual impact	There will be some habitat loss that is an unavoidable impact of the development and cannot be effectively mitigated.						

Impact Phase: Construction Phase							
Impact description: Faunal impacts due to construction-phase noise and physical disturbance							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	H	H
With Mitigation	L	L	M	Negative	L	L	M
Can the impact be reversed?	Construction-phase disturbance will be transient, but some habitat loss would be long term.						
Will impact cause irreplaceable loss or resources?	Not likely as there do not appear to be any significant populations of species of conservation concern within the affected area.						
Can impact be avoided, managed or mitigated?	Only partly as noise and construction phase disturbance and habitat loss cannot be entirely avoided or mitigated.						
Mitigation measures: • Preconstruction walk-through of the facility to identify areas of faunal sensitivity such as occupied burrows.							

• During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person. • The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site. • No fires should be allowed on site as the vegetation is vulnerable to runaway fires. • No fuelwood collection should be allowed on-site. • No dogs or cats should be allowed on site at the construction camps apart from those of the landowners. • If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • No unauthorized persons should be allowed onto the site and site access should be strictly controlled. • All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site. • All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often needlessly persecuted.	
Residual impact	Noise and disturbance during construction cannot be well mitigated, but would be transient. Some habitat loss for fauna would persist for the operational lifetime of the facility.

Impact Phase: Operational Phase							
Impact description: Faunal impacts due to operational phase activities							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	M	H	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?	The impact will persist for the lifespan of the facility.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Some management is possible, but residual impact from the wind turbines and general disturbance will persist, albeit at a low intensity.						
Mitigation measures: • Management of the site should take place within the context of an Open Space Management Plan. • No unauthorized persons should be allowed onto the site. • Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required. • If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behavior and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of such fenced areas and not the outside.							

Residual impact	Residual impacts will be low and restricted to some low-intensity disturbance associated with the maintenance activities at the site as well as some noise impacts associated with the operation of the turbines.

Impact Phase: Operational Phase							
Impact description: Following construction, the site will be highly vulnerable to soil erosion							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	With appropriate mitigation the impact can be ameliorated.						
Will impact cause irreplaceable loss or resources?	The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.						
Can impact be avoided, managed or mitigated?	With appropriate control measures, erosion risk can be well mitigated.						
Mitigation measures: • Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. • All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.							
Residual impact	With mitigation there would be negligible residual impact.						

Impact Phase: Operational Phase							
Impact description: Following construction, the site will be highly vulnerable to alien plant invasion.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	With appropriate mitigation the impact can be ameliorated.						
Will impact cause irreplaceable loss or resources?	With mitigation there would no loss of resources.						
Can impact be avoided, managed or mitigated?	With appropriate control measures, alien plants can be controlled and reduced to very low impact.						
Mitigation measures: • Develop and implement an Invasive Alien Plant Management Plan. • Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem species such as Opuntia are already present in the area and are likely to increase if not controlled.							

• Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as these are also likely to be prone to invasion problems. • Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Residual impact	With mitigation there would be negligible residual impact.

Impact Phase: Operational Phase							
Impact description: Impact on Critical Biodiversity Areas and Broad-Scale Ecological Processes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	H	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	The impact would last for the lifetime of the development.						
Will impact cause irreplaceable loss or resources?	Unlikely.						
Can impact be avoided, managed or mitigated?	To some extent, but some of the impact would result from the presence of the facility which cannot be avoided.						
Mitigation measures: • Minimise the development footprint, especially within the high sensitivity areas. • There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora. • Specific avoidance and mitigation may be required to reduce the impact on certain habitats of limited extent and high ecological or conservation significance.							
Residual impact	Some of the impact results from the presence of the facility and would therefore persist for as long as it was operational.						

Impact Phase: Decommissioning Phase							
Impact description: Faunal impacts due to decommissioning phase activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	H	Negative	M	H	H
With Mitigation	L	L	M	Negative	L	L	H
Can the impact be reversed?	The impact would be transient and persist for the decommissioning period only.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Most of the impacts can be mitigated and those that cannot would be transient.						
Mitigation measures: • Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped.							

• All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned.	
Residual impact	Decommissioning would in principle return the site to its former state, but in practice, some degradation of the development footprint can be anticipated, which would reduce its long-term value as faunal habitat.

Impact Phase: Decommissioning Phase							
Impact description: Following decommissioning, the site will be highly vulnerable to soil erosion.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Negative	H	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	With appropriate mitigation the impact can be ameliorated.						
Will impact cause irreplaceable loss or resources?	The loss of large amounts to topsoil would potentially be an irreplaceable loss of resources, but with mitigation, this can be avoided.						
Can impact be avoided, managed or mitigated?	With appropriate control measures, erosion risk can be well mitigated.						
Mitigation measures: • Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. • Adhere to Erosion Management and Rehabilitation Plans.							
Residual impact	With mitigation, there would be little residual impact.						

Impact Phase: Decommissioning Phase							
Impact description: Following decommissioning, the site will be vulnerable to alien plant invasion.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	With appropriate mitigation the impact can be ameliorated.						
Will impact cause irreplaceable loss or resources?	With mitigation there would no loss of resources.						
Can impact be avoided, managed or mitigated?	With appropriate control measures, alien plants can be controlled and reduced to very low impact.						
Mitigation measures: • Compliance with Invasive Alien Plant Management Plan. • Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species.							

• Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. • Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem at the site. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	
Residual impact	With mitigation, there would be little residual impact.

10.3 Conclusion

The footprint of the proposed project is largely restricted to the lower-lying eastern slopes and gentle hills of the site and are considered generally suitable for development. The abundance of plant species of conservation concern in these areas is low and species of high conservation concern were not observed within the development footprint.

Although there are a variety of mammals of conservation concern known from the broader area it is not likely that the affected areas are of high significance for these species and long-term impacts on listed fauna are likely to be low.

A small portion of the Highlands South WEF lies within a tier 2 CBA aimed at maintaining the broad-scale connectivity of the landscape. As this Tier 2 CBA would only be affected by one turbine position it is not expected that any significant impacts on the CBA will occur. The majority of the development footprint lies within a NPAES focus area. The development however lies on the margin of the NPAES focus area and the extent of the development would not significantly impact ability to meet conservation targets elsewhere within the focus area which is large in comparison with the development site. Similarly, there are no other renewable energy developments in the immediate area with the result that cumulative impacts within 50 km of the site are still very low. In the wider area there are several existing wind farms, but these are on different ridge systems and the overall extent of cumulative impact in the area remains low.

Although there are extensive areas of sensitive habitat within the Proposed Development Area, the development footprint is restricted to the medium and low sensitivity parts of the site. These areas are considered suitable for development and there are no impacts associated with the Highlands South WEF that cannot be mitigated to a low level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layouts provided for the assessment, the Highlands South WEF can be supported from a terrestrial ecology point of view.

The Final Mitigated Layout provided by the developer and which is being submitted for approval by DEA has been inspected in detail and avoids the no-go areas and high sensitivity features of the site and is therefore considered acceptable and meets the requirements of this study in terms of planning-stage mitigation and avoidance.

11 AVIFAUNA

11.1 Description of the Baseline Environment

The baseline avifauna environment for the proposed development site was defined utilising a desk-based study and informed by four seasons of pre-construction bird monitoring and a specialist nest survey. This information was examined to determine the potential location and abundance of avifauna which may be sensitive to development, and to understand their conservation status and sensitivity.

The following bird microhabitats were identified on the Proposed Development Site: Open Grasslands, Thicket and Scrubs, Cultivated Fields and Pastures, Rivers and Drainage Lines,

Farm dams, Ridges and/or Cliffs, Farmsteads and Feeding Kraals, and Stands of Alien Trees.

Across all four seasonal surveys a total of 809 flight paths from 32 positively identified target species have been recorded on the proposed development site. This equates to approximately 3.41 target species birds per hour of observation.

For priority species only (including unidentified raptors which are likely priority species), the overall passage rate on the proposed development site is calculated as 2.75 birds/hour of observation. Considering that the data is heavily skewed by the influx of summer migrants, if one removes Amur Falcon and Lesser Kestrel for the calculation, the resultant passage rate for the remaining priority species is calculated at 1.60 birds/hour on the WEF site.

Overall 164 species were observed on the proposed development site. Of these 26 were priority species including 13 Red Data species. These results represent a relatively moderate to high diversity of species, and a relatively high number of Red Data and priority species in the specialists' experience of other WEF sites worked on in South Africa, and generally in the Eastern Cape, although some sites in the Eastern Cape have recorded similar numbers of Red data and priority species. A full list of recorses species is presented in Volume II: Bird Impact Assessment Report.

Following the conclusion of the monitoring work, and considering all the other desk-based data sources, the following species were identified as being key for the assessment of impacts of the WEFs and grid connections proposed on the development site. These 'focal species' are: Ludwig's Bustard; Blue Crane; Secretarybird; Cape Vulture; Verreaux's Eagle; Black Harrier; Amur Falcon; Lesser Kestrel; Jackal Buzzard; and African Rock Pipit.

11.2 Avifaunal Site Sensitivity

No-Go areas for turbines only (other infrastructure permitted) include nest buffers, steep slopes and steep slopes buffered by 200m; cultivated lands and a 200 m buffer of National Freshwater Ecosystem Priority Areas (NFEPA) rivers and wetlands (including dams) (Figure 11.1). They also include high and very high flight sensitivity zones buffered by 50 m (to allow for some error in observer accuracy).

No-Go areas for all infrastructure are 1 km buffers around selected active nest sites and 1.5 km buffers around active Verreaux's Eagle nest sites, in line with applicable guidelines, and primarily intended to reduce disturbance and displacement impacts.

11.3 Assessment of Potential Impacts

The main impacts on avifauna have been identified as (a) displacement through disturbance and habitat destruction and (b) mortality through collisions with turbines and/or powerlines and (c) mortality through electrocution on live power infrastructure.

Impact Phase: Construction Phase							
Impact description: Destruction of habitat used by birds							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	M	H	H
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?			Yes, areas disturbed during construction can be rehabilitated after construction and after decommissioning				

Will impact cause irreplaceable loss or resources?	No, rehabilitation of habitat is possible. There is extensive avifaunal habitat on the project site and beyond that will remain intact and be available for use
Can impact be avoided, managed or mitigated?	Yes, the total area of impact (and thus the severity rating) can be minimised.

Mitigation measures:

- A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat;
- Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced;
- High traffic areas and buildings such as offices, batching plants, storage areas etc. should where possible be situated in areas that are already disturbed;
- Existing roads and farm tracks should be used where possible;
- The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths;
- No turbines should be constructed in no-go areas, while associated infrastructure should be avoided where possible in these areas;
- Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats within which construction activities may need to be excluded; Should priority species nests be located, a protective buffer may be applied, within which construction activities may need to be restricted during the breeding season for that species;
- Any clearing of large trees (>5m in height), especially stands of large alien trees (e.g. Blue Gum or Pine) on site should be approved first by an avifaunal specialist. Before, clearing, the location and description of the trees should be provided to the specialist, who may request the ECO to inspect the trees for any nests prior to clearing. .
- The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) are to be trained to identify Red Data and priority bird species, as well as their nests. If any nests or breeding locations for this species are located, an avifaunal specialist is to be contacted for further instruction; and
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the CEMP.

Impact Phase: Construction Phase

Impact description: Disturbance and Displacement of Birds

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	M	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M

Can the impact be reversed?	Partially, in some areas of the operational WEF, birds disturbed during construction may return to their activities after completion of construction.
Will impact cause irreplaceable loss or resources?	Possible, Disturbance and potential displacement of birds may impact breeding and thus impact on the population of a species.
Can impact be avoided, managed or mitigated?	Partially, some disturbance is inevitable with the activities associated with construction.

Mitigation measures:

- A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced;

- Prior to construction, the avifaunal specialist should conduct a site walkthrough, covering the final infrastructure (e.g. road, substation, offices, turbine positions etc.) to identify any nests/breeding/roosting activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. Following the specialist site walkthrough, any additional sensitive zones and no-go areas (e.g. nesting sites of Red Data species) are to be designated by the specialist who should advise on an appropriate buffer, within which construction activities may not occur during key breeding times;
- The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed;
- During the construction phase, an avifaunal specialist must conduct a nest survey/exploration of the WEF site. This should be done during and after, the breeding season (i.e. approximately in July and again in September) of large Eagles (e.g. Martial and Verreaux's Eagle). The aim will be to locate any nest sites not yet found, so that these may continue to be monitored during the construction and operation phases, along with the monitoring of already identified nest sites (see point below); and
- Appoint a specialist to design and conduct monitoring of the breeding of raptors at the various nests identified to date as well as any additionally located nests (see point above). This monitoring can be combined with the exploration described above, and should be conducted on two occasions (i.e. approximately in July and again in September) across each calendar year, during construction. The aim will be to monitor any disturbance to or displacement of the breeding birds during construction.

Impact Phase: Operational Phase							
Impact description: Bird mortality caused by collision with wind turbine blades and/or towers							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	H	Negative	M	H	M
With Mitigation	M	M	H	Negative	M	M	M
Can the impact be reversed?			Partially, bird fatalities caused by collisions with turbines are irreversible. However local populations may recover if the occurrence of deaths is low.				
Will impact cause irreplaceable loss or resources?			Possibly, collisions with turbines cause bird fatalities, which could significantly impact local and/or regional populations of certain species.				
Can impact be avoided, managed or mitigated?			Partially, the probability of the impact can potentially be reduced through informed placement of turbines.				

Mitigation measures:

- The minimum number of turbines should be constructed to achieve the required MW output. It is preferable to have smaller number of turbines with larger rotor, compared with more turbines with smaller rotor.
- Turbines must not be constructed within any designated No-Go Areas. The turbine blade should not protrude into these areas, and therefore the bases should be constructed suitably far from these areas to prevent this;
- The hierarchy of sensitivity zones identified should be considered where possible with preferential placement of turbines in areas with no sensitivity score, followed by low sensitivity, medium sensitivity and medium-high sensitivity;
- Develop and implement a carcass search programme for birds as a minimum during the first three years of operation followed by year 5, 10, 15, 20 and 25, in line with the applicable South African monitoring guidelines;
- Develop and implement a minimum 12 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the applicable

South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. The results of this monitoring and the carcass searchers should advise the need for any additional ongoing activity monitoring or nest surveys beyond the 12 month period;
- Conduct frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development;
- The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist after consultation with BLSA, relevant stakeholders and an independent review), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigation options to be implemented. Mitigations that may need to be implemented (and should be considered in the project's financial planning) include:
  - Onsite and off-site habitat management. A habitat management plan which aims to prevent an influx/increase in preferred prey items in the turbine area due to the construction and operation activities, while improving raptor habitat and promoting prey availability away from the site.
  - Implementing a carcass management plan on the WEF site, to remove any dead livestock as soon as possible, to reduce the likelihood of attracting vultures to the WEF site.
  - Using deterrent devices (e.g. visual and noise deterrents) and/or shutdown systems e.g. Automatic bird detectors (e.g. automated camera based monitoring systems – McClure et. al. 2018) if commercially available; or Radar Assisted Shutdown on Demand (RASOD) to reduce collision risk.
  - Identify options to modify turbine operation (e.g. temporary curtailment or shut-down on demand) to reduce collision risk if absolutely necessary and other methods have not had the desired results.
  - Possibly offset programmes if no suitable mitigation measures can be implemented to reduced impacts sufficiently.

Impact Phase: Operational Phase							
Impact description: Bird mortality caused by collision overhead powerlines on the WEF site.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	H	Negative	M	M	M
With Mitigation	L	M	M	Negative	L	L	M
Can the impact be reversed?			Possibly, bird fatalities caused by collisions with overhead power lines are irreversible. However local populations may recover if the occurrence of deaths is low.				
Will impact cause irreplaceable loss or resources?			Unlikely, collisions with overhead power lines causes bird fatalities which may significantly impact populations of certain species.				
Can impact be avoided, managed or mitigated?			Yes, reducing the total distance of overhead power lines and increasing their visibility by fitting bird flight diverters (BFD's) can reduce the number of collisions.				

Mitigation measures:

- Place new internal power lines on the WEF underground where possible and technically feasible;
- Placement of electrical infrastructure should consider avifaunal sensitivity zones and avoid areas of higher sensitivities where possible;
- Where possible place new overhead power lines adjacent to existing power line or linear infrastructure (e.g. roads and fence lines);
- Attach appropriate marking devices (BFDs) on all new overhead power lines to increase visibility. The advice of a specialist should be sought regarding the type, placement and spacing of the BFDs to be used; and
- Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins et al. 2015). This program must include monitoring of overhead power lines.

Impact Phase: Operational Phase							
Impact description: Bird mortality caused by electrocution on the WEF site.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	M	M	M
With Mitigation	L	M	M	Negative	L	L	H
Can the impact be reversed?	Possibly, bird fatalities caused by electrocution are irreversible. However local populations may recover if the occurrence of deaths is low.						
Will impact cause irreplaceable loss or resources?	Possibly, electrocution from overhead power lines causes bird fatalities which could significantly impact populations of certain species.						
Can impact be avoided, managed or mitigated?	Yes, reducing the total length of overhead power lines and using a safe pylon design can reduce the risk of electrocution.						
Mitigation measures: • Placement of electrical infrastructure should consider avifaunal sensitivity zones and avoid areas of higher sensitivities where possible; • Place new internal power lines on the WEF underground where possible and technically feasible; • Any new overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components and possible bird perches (e.g. cross arms) of 1.8 m or greater. Each pylon should be fitted with a safe bird perch; and • Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins et al. 2015). This program must include monitoring of overhead power lines.							

Impact Phase: Operational Phase							
Impact description: Disturbance to birds resulting in temporary/permanent displacement or disrupting breeding success.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	L
With Mitigation	L	M	M	Negative	L	L	L
Can the impact be reversed?	Possibly, after decommissioning and rehabilitation displaced species will possibly return.						
Will impact cause irreplaceable loss or resources?	Possible, disturbance and potential displacement of birds may impact breeding and thus impact on the population of a species.						
Can impact be avoided, managed or mitigated?	Partially, some disturbance is inevitable with the operational activities						
Mitigation measures: • A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance. All contractors are to adhere to the OEMP and should apply good environmental practice during all operations; • The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and an avifaunal specialist must be contacted for further instruction; • Operational phase bird monitoring, in line with applicable guidelines, must be implemented and must include monitoring of all raptor nest sites for breeding success; and							

• No turbines should be placed in no-go areas to be identified through pre-construction monitoring, while associated infrastructure should be avoided where possible in these areas.

Impact Phase: Operational Phase							
Impact description: Disruption of Local Bird Movement Patterns (e.g. barrier effects).							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	L	L	L
With Mitigation	M	M	M	Negative	L	L	L
Can the impact be reversed?			Possibly.				
Will impact cause irreplaceable loss or resources?			Possibly, impact is not well understood.				
Can impact be avoided, managed or mitigated?			Possibly.				
Mitigation measures: • The lowest feasible number of turbines should be constructed for the required MW output. Therefore, fewer larger (i.e. with a higher MW output) turbine models should be favoured where possible; • Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species; and • Turbines must not be constructed within any No-Go areas.							

Impact Phase: Decommissioning Phase							
Impact description: Disturbance and Displacement of Birds							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?			Unknown				
Will impact cause irreplaceable loss or resources?			Unlikely, disturbance and potential displacement of birds may impact breeding and thus impact on the population of a species.				
Can impact be avoided, managed or mitigated?			Partially, some disturbance is inevitable with the activities associated with decommissioning.				
Mitigation measures: • A site specific Environmental Management Plan must be implemented, for the decommissioning phase. • Environmental Control Officers to oversee activities and ensure that the site specific EMP is implemented and enforced; • The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.							

11.4 Conclusion

Activity and abundance of priority species and red data species were found to be moderate to high on the proposed Highlands development. Activity of other resident Red Data species, e.g. Verreaux's Eagle, Blue Crane and Ludwig's Bustard was relatively constant across the year, at a moderate level. Activity of the non-Red Data raptors, Jackal Buzzard and Rock Kestrel was high to very high throughout the year, and these species are the ones most likely to suffer collision mortality.

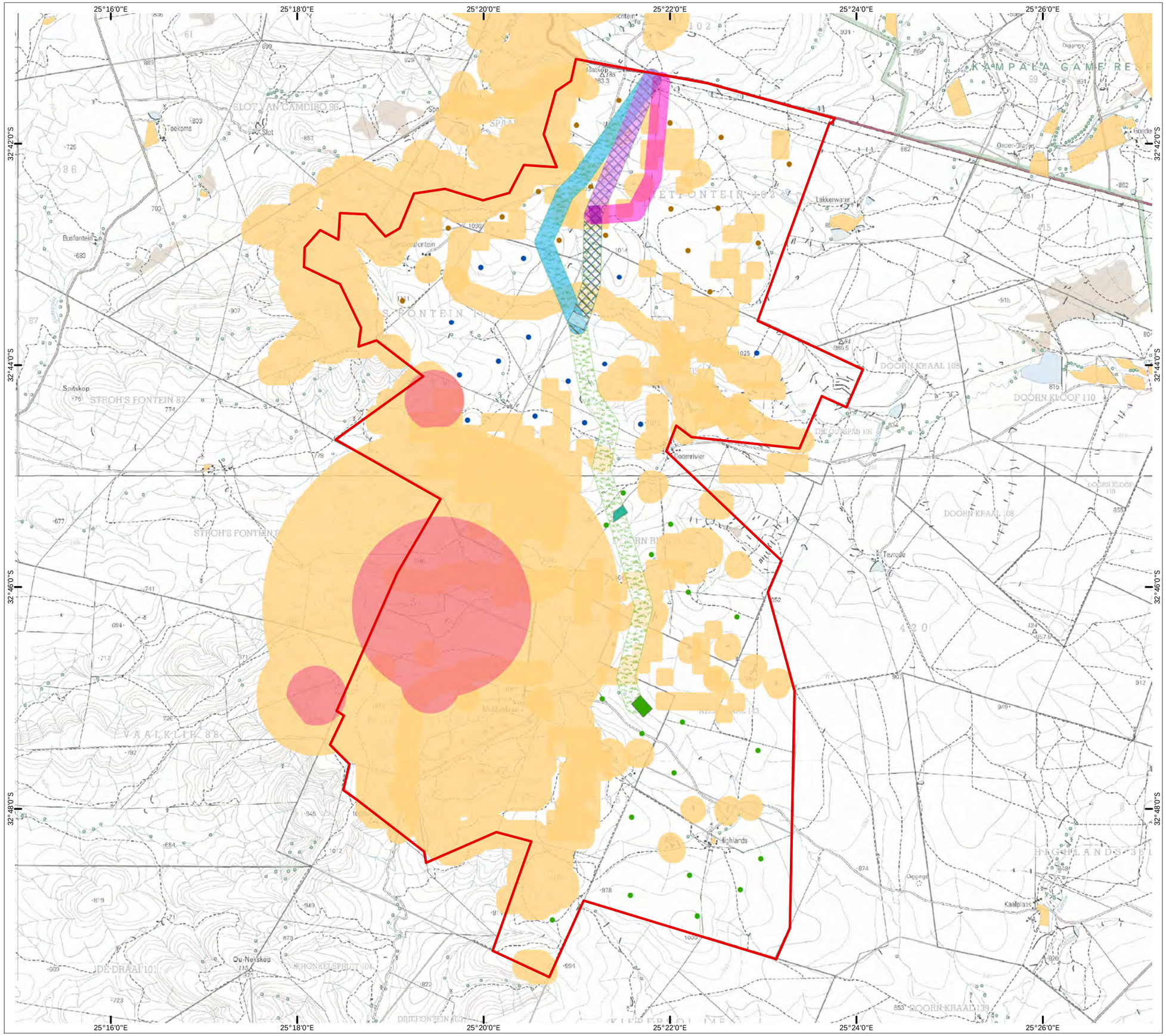
Abundances of small passerines were found to be moderate, however it was predicted that the impacts to these birds was likely to be low.

Verreaux's Eagle were confirmed as breeding on and around the proposed development site, and all nests have been suitably buffered by 3 km, with no turbines proposed within these buffers. Recorded Verreaux's Eagle flight activity was relatively high compared with other priority species recorded, although when compared with the activity of this species on other WEFs in South Africa, the activity levels are moderate. All proposed turbines are located outside of high risk areas (e.g. ridge and slope buffers, nest buffers and high recorded flight activity areas) and therefore an additional year of monitoring is not recommended. While it is likely that this species will suffer collision mortality at some stage during operations of the proposed development, the amount and frequency of collisions are not expected to reach a level that would be unsuitable for the regional population. Furthermore, if mortalities are recorded certain mitigation options can be implemented (subject to the results of operational monitoring), that can reduce the levels of mortality.

Two Verreaux's Eagles (preferably one from each active territory) should be fitted with GPS tracking devices (subject to ethical clearance from BLSA ethics committee) at the start of the construction phase. This information would feed into the construction and operational monitoring programme and would assist in determining disturbance and displacement effects (as well as possible collision impacts).

Cape Vulture was only recorded during the final summer season, with an estimated minimum of 8 birds, being responsible for 11 recorded flights. Overall, this represented a very low passage rate, with most activity also being on the northern boundary of the proposed development site (an area that does not have proposed turbine locations in the latest layout). It was concluded that Cape Vulture is only likely to be an occasional visitor to the proposed Development site, and should mortalities occur for this species (which is unlikely but possible), they could be mitigated (or reduced in future) by implementing mitigation such as carcass management strategies and/or shut down on demand strategies. Regarding this species, more concern is around cumulative impacts. If low mortality manifests at the proposed Development, this may be acceptable (at the scale of the development). However, if this low level of mortality coincides with high levels of mortality at the WEFs in the Cookhouse/Bedford area, the cumulative impacts to the regional population could be high. It will be essential, to reduce cumulative effects, that all WEFs in the region implement mitigations and recommendations given by the respective avifaunal specialists, and that there is collaboration and sharing of information between specialists.

Ludwig's Bustard and Blue Crane were relatively widespread and abundant, although they did not fly regularly at turbine risk height. They are therefore more likely to be impacted upon by possible disturbance or through collisions with overhead power lines, associated with either the WEFs or the grid connections. Both of these impacts can be mitigated against. It will be vitally important to ensure all overhead lines are correctly marked with BFD's, and if the shortest routes for the grid connections are used the impacts are likely to be low-moderate and acceptable, although ongoing monitoring of overhead lines during operation will be required to confirm this. It is likely that the vast majority of spans will need to be mitigated, and suitable financial allowance should be made for this.



Basemapping from Chief Directorate: National Geo-Spatial Information of South Africa

ARCUS

- Proposed Development Area
- No Go for Turbines Only
- No Go for all infrastructure
- Substation A
- North WEF Proposed Turbine Position
- North WEF Grid Alternative 1
- North WEF Grid Alternative 2
- Central WEF Proposed Turbine Position
- Substation B
- Central WEF Grid Alternative 1
- Central WEF Grid Alternative 2
- South WEF Proposed Turbine Position
- Substation C2
- Substation C1
- South WEF Grid Alternatives

1:72,642 Scale @ A3

N

0 1.5 3 km

Produced: AA Reviewed: SC Approved: AB	Ref: 2705/REP/025 Date: 08/08/2018

Combined Avifaunal Sensitivity
Figure 11.1

Highlands **WEFs**
Basic Assessment **Report**

The rated impacts of each WEF phase and Grid Connection separately were found to be acceptable. However, if all phases are granted EA, they will not be constructed as separate WEFs, and not all turbines proposed for each phase would be constructed. Therefore an assessment of a WEF[13] up to a maximum of 140 MW and utilising turbine positions from all three phases (which is likely to result in less than 40 turbines being constructed) was conducted. This assessment found that the impact (post mitigation) of collision is likely to be moderate and the other identified impacts on avifauna are likely to be low. Therefore the construction of a medium sized WEF of less than 40 turbines would be acceptable, if all turbine positions are outside of all the identified avifaunal No-Go areas and all other mitigations and recommendations in this report are implemented. It is noted that based on the rapid pace of technology advancement, less turbines (each with a higher capacity) may be used to meet the required MW output, and wherever feasible this should be encouraged as for birds, fewer larger turbines are preferable than more smaller turbines.

The turbine positions in the assessed layout and the final mitigated layout avoid all avifaunal no-go areas and high sensitivity buffers and are acceptable.

12 BATS

12.1 Description of the Baseline Environment

12.1.1 Habitats

Micro-habitats available to bats in and around the site for foraging and commuting include grassland, livestock water points and dams, drainage lines, thicket and woodland vegetation, cultivated areas, and stands of alien trees around farmsteads. Roosting micro-habitats include rocky outcrops, trees and buildings.

12.1.2 Bat Species

The project falls within the actual or predicted distribution range of approximately 14 species of bat. Analysis of the acoustic monitoring data suggests that at least four species of bat are present (Table 12.1). The sensitivity of each of these species to the proposed WEF's is a function of their conservation status and the likelihood of risk to these species from WEF development. The likelihood of risk to impacts of wind energy was determined from the guidelines and is based on the foraging and flight ecology of bats and migratory behaviour.

Table 12.1: Bat Species Recorded at the Project and their Sensitivity to WEFs

Species	Species Code	# of Bat Passes[14]	Conservation Status[15]		Likelihood of Risk
			National	International	
Egyptian free-tailed bat *Tadarida aegyptiaca*	EFB	10,755	Least Concern	Least Concern	**High**
Natal long-fingered bat *Miniopterus natalensis*	NLB	1,937	Least Concern	Least Concern	**High**
Temminck's myotis *Myotis tricolor*	TM	224	Least Concern	Least Concern	**Medium-High**
Cape serotine *Neoromicia capensis*	CS	5,804	Least Concern	Least Concern	**Medium-High**

[13] Bid as two separate projects in the REIPP with two separate grid connections.

[14] A sequence of two or more echolocation calls separated from other calls by more than 500 milliseconds.

[15] Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T. eds., 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

12.1.3 Spatio – Temporal Bat Activity Patterns

A total of 18 720 bat passes were recorded from 393 sample nights across the four species and across all bat detectors (Table 12.2). A median of 28 bat passes per night were recorded across the monitoring period. Overall, the levels of bat activity were low for most of the sampling period but this varied, and there were some periods when activity was moderate. Temporally isolated peaks in the total number of passes per night occurred in early August, at the end of October and during a one week period at the end of March leading into the beginning of April.

Table 12.2: Acoustic Monitoring Summary

Monitoring Location	Altitude (masl)	# of Sample Nights	% of Sample Nights with Bat Activity	Total number of Bat Passes
HIGH1	871	347	86.2	4,003
HIGH2	957	370	74.3	2,449
HIGH3	1001	246	68.7	4,773
HIGH4	839	104	71.2	2,922
HIGH5	991	303	55.1	765
METLOW	1093	296	76.7	3,569
METHIGH	1183	296	23.6	239

The monitoring data revealed seasonal patterns in bat activity. Bats were more active in spring and autumn and least active in winter.

There was no clear pattern for individual species activity relative to months. All species had lowest activity in May and June.

Bat activity in accordance with altitude and proximity to features of importance for bats; the differences in the proportion of bat activity recorded in each season, at each monitoring location and the bat active times at the WEF site is described in the Bat Specialist Report (Volume II).

Very little bat activity was recorded below 12 °C. In winter, bat activity increased markedly for temperatures between approximately 16 °C and 23 °C. In summer, the majority of the activity was recorded between approximately 18 °C and 28 °C. In autumn, the majority of the bat activity was recorded between approximately 18 °C and 25 °C. In spring, the majority of the bat activity was recorded between approximately 16 °C and 26 °C.

The highest wind speed in which bats were recorded was 15.5 m/s but the average wind speed in which bats were recorded was 4.9 m/s at 10 m, and 6.5 m/s at 90 m. At 10 m across all seasons, very little activity was recorded above 6 m/s to 7.5 m/s. At 90 m, in autumn, spring and summer, approximately 30 % to 40 % of recorded bat activity occurred below wind speeds of 3 m/s (the potential cut-in speed of the candidate turbines). In winter, only 5 % occurred below 3 m/s. Approximately 80 % to 90 % of the bat activity was recorded below 6.5 m/s in autumn, 8 m/s in spring, 9 m/s in summer and 10 m/s in winter respectively (Figure 12.1).

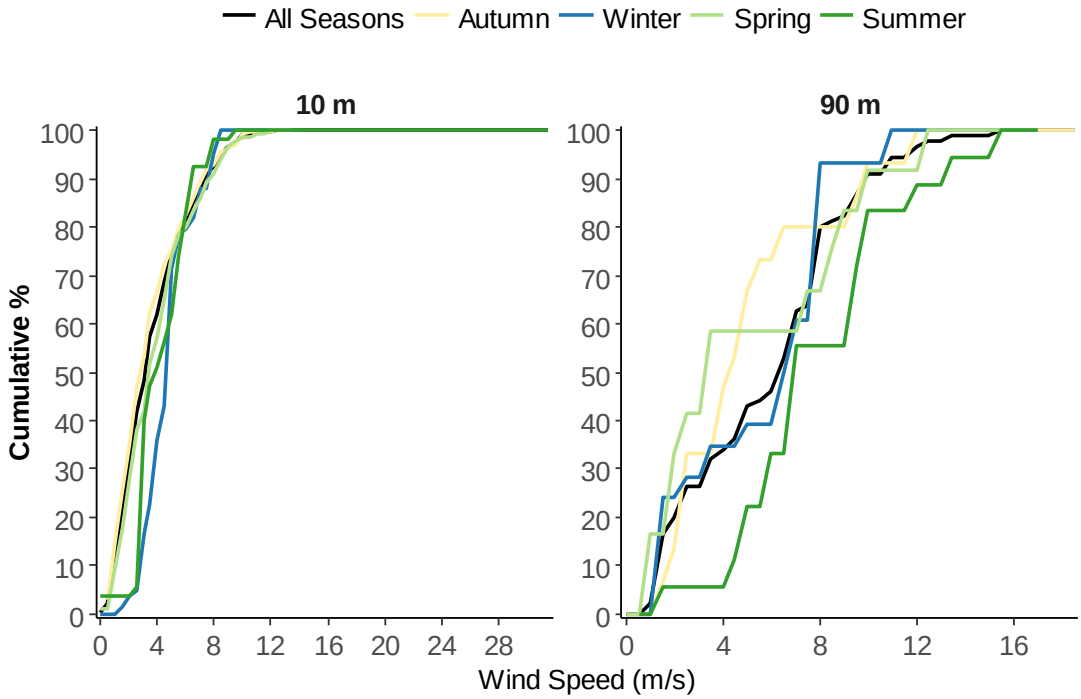


Figure 12.1: Accumulation curves of bat activity across all species with increasing wind speed per season.

12.1.4 Bloukrans Cave

During the May 2017 survey, it was estimated that approximately 2000 – 3 000 Cape horseshoe bats were present in the cave. These bats, which have a low risk to wind turbine induced mortality, were not recorded on the proposed development site. Several individual Natal long-fingered bats were also counted. In October 2017 (spring) a minimum of 500 Natal long-fingered bats were present in the cave but it is possible that over 1000 individuals were present.

Activity of Natal long-fingered bats on the site was low during the pre-construction monitoring. The period of highest activity for this species across the site was during November (1.8 passes per night) and December (1.9 passes per night). The distance from the cave to the edge of the proposed WEFs (approximately 8 km) therefore appears to be of a sufficient distance that most Natal long-fingered bats do not forage there.

The risks to Natal long-fingered bats would increase during the times of the year when they are moving to and from the cave (i.e. autumn and spring) as this might necessitate these bats moving across the wind farm, increasing risk of mortality. There was no obvious difference in Natal long-fingered bat activity recorded between autumn, spring and summer which might suggest that this species does not cross the site from the east (where there are known roosts) to reach the cave in the west, at least during the current monitoring period.

Based on these results and best-practise guidelines, a 20 km radial buffer has been placed around the cave inside which features that are important for bats have been buffered by larger distances than normal. For example, a 350 m wetland buffer has been applied as opposed to a 200 m buffer (Figure 12.2). This 20 km buffer encompasses the entirety of the three proposed development site. In addition, a 5 km no go buffer must be placed around the cave but this does not impact the current development boundaries.

12.2 Assessment of Potential Impacts

WEFs have the potential to impact bats directly through collisions and barotrauma resulting in mortality, and indirectly through the modification of habitats. Direct impacts pose the greatest risk to bats and, in the context of the project, habitat loss and displacement should not pose a significant risk because the project footprint (i.e. turbines, roads) is small compared to the size of the project.

Direct impacts to bats will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. All the bat species that were recorded on site exhibit behaviour that may bring them into contact with wind turbine blades. They are thus potentially at risk of negative impacts if not properly mitigated, although the magnitude of these impacts are unknown at this stage.

Impact Phase: Construction Phase

Impact description: Roost disturbance

WEFs have the potential to impact bats directly through the disturbance of roosts during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), grid connection transmission line and installation of wind turbines. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats; Monadjem et al. 2010) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. However, it is unlikely that this impact will occur as there are low numbers of roosting spaces where development is planned. Therefore, the significance of this impact would be low.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M

Can the impact be reversed?	Unknown
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- It may be possible to limit roost abandonment by avoiding construction activities near roosts. No confirmed roosts have been found at the project but there are potential roosts that bats may be using including trees, rocky crevices and buildings.
- It is recommended that a bat specialist survey the confirmed turbine locations and all other proposed site infrastructure for the presence of roosts within 200 m before any construction activities commence and once the preliminary design and layout of each WEF is complete.

Will this impact contribute to any cumulative impacts?	The cumulative impact of bats abandoning their roosts is dependent on the number of roosts affected, the species involved and extent of the impact across the assessed region. With effective management of the construction process across the cumulative developments and limiting roost disturbance, the cumulative impacts can be reduced.

Impact Phase: Construction Phase

Impact description: Roost destruction

WEFs have the potential to impact bats directly through the physical destruction of roosts during construction. Relevant activities include the construction of roads, O&M buildings, sub-station(s), grid connection

transmission lines and installation of wind turbines. Potential roosts that may be impacted by construction activities include trees, crevices in rocky outcrops and buildings. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts. It is likely that roost destruction will occur if construction activities require the removal of trees, buildings and blasting rocky outcrops. If bats are occupying such roosts at the time they are destroyed it is likely this could result in mortality. However, a low numbers of roosts will likely need to be destroyed resulting in the significance of this impact being low after mitigation.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	L	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- The WEF infrastructure must be designed and constructed in such a way as to avoid the destruction of potential roosts, particularly trees, rocky crevices (if blasting is required) and buildings.
- No construction activities with the potential to physically affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and mitigation.
- It is recommended that a bat specialist surveys the confirmed turbine locations and the locations of all other site infrastructure, such as pylons, for the presence of occupied roosts among the potential roosts before any construction activities commence and once the preliminary design and layout of the site is complete.
- If occupied roosts are confirmed these should be buffered based on best practice guidance, which includes a minimum buffer of 200 m.
- A site-specific Construction Phase Environmental Management Plan (CEMP) must be created, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of bat habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction.
- During construction, laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off road driving.
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the CEMP.

Will this impact contribute to any cumulative impacts?	The cumulative impact of destroying multiple roosts across a region will be negative. With mitigation, effective design of WEFs and preventing roost destruction, the cumulative impacts can be reduced.

Impact Phase: Construction Phase

Impact description: Habitat modification

Bats can be impacted indirectly through the modification or removal of habitats (Kunz et al. 2007b) and can also be displaced from foraging habitat by wind turbines (Millon et al. 2018). The removal of vegetation during the construction phase will impact bats by removing vegetation cover and linear features that some bats use for foraging and commuting (Verboom and Huitema 1997). The modification of habitat could create linear edges which some bats to commute or forage along. This modification could also create favourable conditions for insects upon which bats feed which would in turn attract bats. The footprint of the facility is small relative to the remaining habitat available in the surrounding area and as such the removal of vegetation is not likely to result in a significant impact. This impact can be reduced even further by limiting the removal of vegetation as far as possible.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- This impact must be reduced by limiting the removal of vegetation as far as possible. A site-specific CEMP must be created, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of bat habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction.
- Before construction commences, a bat specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any roosts/activity of sensitive species, as well as any additional sensitive habitats.
- During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off-road driving.
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the CEMP.

Will this impact contribute to any cumulative impacts?	Cumulative impacts should be low because of the limited amount of vegetation that would be removed at operating WEFs relative to the large area in the region that would not be developed. However, this will depend on the types of vegetation that are removed because the cumulative impact of removing endangered habitat will be greater than removing habitat that is not threatened.

Impact Phase: Operational Phase

Impact description: Bat mortality during commuting and/or foraging

The major potential impact of wind turbines on bats is direct mortality resulting from collisions with turbine blades and/or barotrauma (Grodsky et al. 2011; Horn et al. 2008; Rollins et al. 2012). These impacts will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. All species of bat that were recorded at the project exhibit behaviour that may bring them into contact with wind turbine blades and so they are potentially at risk of negative impacts.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	L	Negative	L	L	M
Can the impact be reversed?	No						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. Low lying areas, buildings,

woodland/thicket and areas near water should be avoided. This has been adhered to as all turbines adhere to buffer zones around these features, • The type of turbine used may influence fatality. Taller towers have a positive relationship between the numbers of bats killed at some wind energy facilities in Greece and Canada (Barclay et al. 2007; Georgiakakis et al. 2012). However there are no published data on this relationship in South Africa but unpublished data from other pre-construction monitoring reports suggest that bat activity at height in South Africa is lower. However, some species in South Africa that are not adapted for flight at height have suffered mortality suggesting that some bats may be killed in the lower edge of the rotor swept zone. Therefore, it is preferable to use taller towers (max limit in EC is 200 m), but limit the rotor diameter such that the minimum distance between the blades and the ground is maximised. • Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level. • If mortality does occur, the level of mortality should be considered by a bat specialist to determine if this is at a level where further mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity. • It is advised that both pre-construction and operational monitoring data are used to confirm the need for above mentioned mitigation measures such as curtailment and to determine at what stage of the development such mitigation needs to be implemented, if at all.	
Will this impact contribute to any cumulative impacts?	The cumulative impacts will depend on the number of WEFs in the region, the species involved and the levels of bat mortality. Bats reproduce slowly (Barclay and Harder 2003) and their populations can take long periods of time to recover from disturbances so the cumulative impacts can be high if appropriate management and mitigation is not implemented.

Impact Phase: Operational Phase

Impact description: Bat mortality during migration

It has been suggested that some bats may not echolocate when they migrate (Baerwald and Barclay 2009) which could explain the higher numbers of migratory species suffering mortality in WEF studies in North America and Europe. Therefore, the direct impact of bat mortality may be higher when they migrate compared to when they are commuting or foraging. This is therefore considered here as a separate impact of the WEF on the Natal long-fingered bat, which is the only species recorded during pre-construction monitoring known to exhibit long-distance migratory behaviour.

The majority of bat mortalities at WEFs in North America and Europe are migratory species. However, evidence from the pre-construction monitoring does not suggest migratory behaviour through the site. It is therefore unlikely that mortality will occur during migration periods but during the operating lifespan of the WEFs it may be possible that migration patterns and species distributions may change in response to climactic and/or habitat shifts. There may also be inter-annual variation in bat movement patterns which cannot be observed with a single year of data.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	H	M	M	Negative	M	L	M
With Mitigation	M	M	M	Negative	L	L	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. Low lying areas, buildings,

woodland/thicket and areas near water should be avoided. This has been adhered to as all turbines adhere to buffer zones around these features. • The type of turbine used may also influence fatality. Taller towers have a positive relationship between the numbers of bats killed at some wind energy facilities in Greece and Canada (Barclay et al. 2007; Georgiakakis et al. 2012). However there are no published data on this relationship in South Africa but unpublished data from other pre-construction monitoring reports suggest that bat activity at height in South Africa is lower. However, some species in South Africa that are not adapted for flight at height have suffered mortality suggesting that some bats may be killed in the lower edge of the rotor swept zone. Therefore, it is preferable to use taller towers (max aviation limit in the EC is 200 m) but limit the rotor diameter such that the minimum distance between the blades and the ground is maximised. • Operational acoustic monitoring and carcass searches for bats should be performed to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level. In addition, surveys of the Bloukrans cave should be undertaken in spring and autumn to assess changes in the annual movement patterns of the Natal long-fingered bat. • If mortality does occur, the level of mortality should be considered by a bat specialist to determine if this is at a level where further mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity. • It is advised that both pre-construction and operational monitoring data are used to confirm the need for above mentioned mitigation measures such as curtailment and to determine at what stage of the development such mitigation needs to be implemented, if at all.	
Will this impact contribute to any cumulative impacts?	The cumulative impacts will depend on the number of WEFs in the region, the species involved and the levels of bat mortality. Bats reproduce slowly (Barclay & Harder 2003) and their populations can take long periods of time to recover from disturbances so the cumulative impacts can be high if appropriate management and mitigation is not implemented. Impacts may also affect populations over a large geographic area (Lehnert et al. 2014; Voigt et al. 2012) if gene flow is prevented in migratory species.

Impact Phase: Operational Phase

Impact description: Habitat creation in high risk locations

The construction of a WEF and associated building infrastructure may inadvertently provide new roosts for bats, attracting them to the area and indirectly increasing the risk of negative mortality impacts. It has been suggested that some bats may investigate wind turbines for their potential roosting spaces (Cryan et al. 2014; Horn et al. 2008; Kunz et al. 2007b) and bats could therefore be attracted to WEFs, increasing the chance of wind turbine-induced mortality. Bats may also be attracted to roosting opportunities in new buildings and other infrastructure such as road culverts at WEFs (J. Aronson, personal observation). The probability of large numbers of bats roosting in infrastructure at the project is low. However, if any bats do manage to do so, they would be at greater risk of mortality due to the proximity to wind turbines.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	H

Can the impact be reversed?	Yes
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- Bats should be prevented from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise WEF infrastructure, a suitably qualified bat specialist should be consulted before

any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings must be carried out to ensure no access to bats or actively roosting bats.	
Will this impact contribute to any cumulative impacts?	If there are no roosting opportunities for bats at the project or other developments, the cumulative impacts will be low.

Impact Phase: Operational Phase

Impact description: Light pollution

Currently the local region experiences very little light pollution from anthropogenic sources and the construction of a WEF will marginally increase light pollution. This excludes turbine aviation lights which do not appear to impact bats (Baerwald and Barclay 2011; Horn et al. 2008; Jain et al. 2011; Johnson et al. 2003). During the operation of the WEFs, it is assumed that the only light sources would be motion sensor security lighting for short periods and lighting associated with the substation.

This artificial lighting would impact bats indirectly via the mortality of their insect prey thereby reducing foraging opportunities for certain bat species. Lighting attracts (Blake et al. 1994; Rydell 1992; Stone 2012) and can cause direct mortality of insects. These local reductions in insect prey may reduce foraging opportunities for bats, particularly for species that avoid illuminated areas. This impact is likely to be low before mitigation because, relative to the large area in the region that would not be developed that likely supports large numbers of insects, the prey resource for bats is likely to be sufficient. The consequence of this impact will be moderate before and after mitigation but the probability of the impact would reduce to unlikely.

Other bat species actively forage around artificial lights due to the higher numbers of insects which are attracted to these lights (Blake et al. 1994; Rydell 1992; Stone 2012). This may bring these species into the vicinity of the project and indirectly increase the risk of collision/barotrauma particularly for species that are known to forage around lights. These include the Cape serotine and the Egyptian free-tailed bat (Fenton et al. 2004; J. Aronson, personal observation). This impact is likely to be low with mitigation but must be carefully considered because the consequence could be severe without mitigation. Lighting at the project should be kept to a minimum and appropriate types of lighting should be used to avoid attracting insects, and hence, bats.

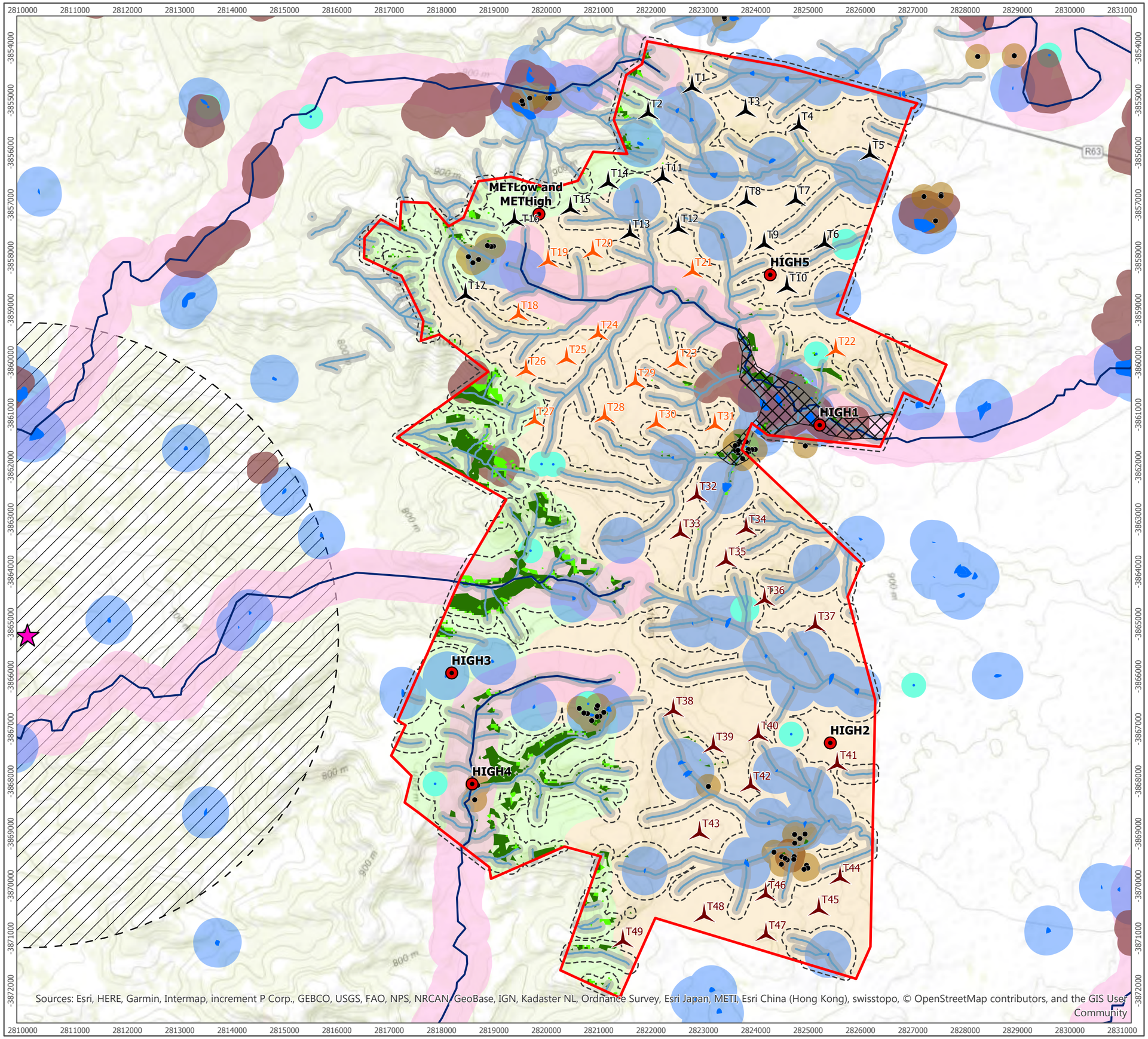
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- This impact can be mitigated by using as little lighting as possible. Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible.

Will this impact contribute to any cumulative impacts?	Cumulative impacts should be low if mitigation is applied because fewer insects would be attracted to lighting, and hence fewer bats would be attracted to feed on them. This would reduce the likelihood of bats encountering wind turbines.

The impacts to bats during the decommissioning phase are likely to be restricted to disturbance. Provided decommissioning activities are restricted to daylight hours, the impact to bats should be low.



ARCUS

- Development Boundary
- Highlands North Final Mitigated Layout
- Highlands South Final Mitigated Layout
- Highlands Central Final Mitigated Layout
- Bat Detector Locations
- Bloukrans Cave
- House/Building
- Drainage Lines
- NFEPA Rivers
- Wetlands and Farm Dams
- Bedford Dry Grassland
- Camdebo Escarpment Thicket
- Southern Karoo Riviere

No-Go Areas for Turbines to Blade Tip (Other Infrastructure Permitted)

- Thicket/Dense bush
- Woodland/Open bush
- 75 m Drainage Line Buffer
- 200 m Cultivated Areas Buffer
- 200 m Building Roost Buffer
- 200 m Dam and Wetland Buffer
- 350 m Dam and Wetland Buffer
- 400 m NFEPA River Buffer
- 5 km Cave Buffer
- 75 m Buffer to Turbine Blade Tip

1:70 000 Scale @ A3

0 1 2 km

NORTH

Produced By: JA	Ref: 2705-REP-015
Checked By: AB	Date: 24/08/2018

Bat Sensitivity
Figure 12.2

Highlands South WEF
Basic Assessment Report

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12.3 Conclusion

The impacts to bat during this phase are likely to be restricted to disturbance. Provided decommissioning activities are restricted to daylight hours, the impact to bats should be negligible.

The bat monitoring data collected and analysed to date suggest that the development of the proposed Highlands South WEF can be achieved without unacceptable risks to bats.

The increased occupation of the Bloukrans cave by the Natal long-fingered bat in October (spring) appears not to have influenced bat activity at the site. This migratory species would be at risk of encountering and colliding with wind turbines as it moves across the landscape to and from winter hibernacula towards the cave in autumn and spring but increased activity during these periods was not observed. It is not known which direction these bats would travel across the landscape to the cave but it is possible that they might move through the proposed WEF especially if they fly from the east, westwards towards the cave. The finding that activity is higher near water, buildings and in the valley or lowland areas is important as an initial step to reduce the impact of the proposed WEF's to bats as the facilities must be designed to avoid these areas based on the sensitivity map. No parts of the turbines, including the blade tips, should enter these buffers.

The significance ratings for the majority of the impacts to bats posed by the development are predicted to be low or medium before mitigation and low after mitigation. Impacts related to bat mortality during migration are predicted to be of medium significance before mitigation and low significance with mitigation. However, cumulative impacts may remain medium after mitigation.

13 NOISE

13.1 Description of the Baseline Environment

Residual Noise Levels

Residual noise levels were measured at four of the potential noise-sensitive developments considered to be representative of the types of acoustic environments present at noise-sensitive developments within the study area.

Table 13.1 summarises the results. As the measurements were made at a range of wind speeds, including those under which the turbines would operate, it is considered appropriate to assume the average of the four sets of measurements as representative residual noise levels for the purposes of the operational noise assessment.

Table 13.1: Residual Noise Levels

Location	Residual Noise Level, Day, $L_{eq,16hr}$, dBA	Residual Noise Level, Night, $L_{eq,8hr}$, dBA
ML1	44	36
ML2	49	29
ML3	46	42
ML4	44	35
Average	**48**	**36**

For the construction noise assessment, as construction noise is not wind speed-dependent in the way that operational noise is, it is considered that the typical outdoor levels in rural districts as described in SANS 10103 are the appropriate representative baseline residual noise levels for the study area , i.e.:

- Day: 45 dBA, $L_{eq,16hr}$; and
- Night: 35 dBA, $L_{eq,8hr}$.

13.1.1 Desired Rating Levels

Desired rating levels during the construction phase (10 dB above typical outdoor levels in rural districts) are:

- Day: 55 dBA, L_{eq}; and
- Night: 45 dBA, L_{eq}.

Desired rating levels during the operational phase are:

- Day: 55 dBA, L_{eq} (7 dBA above the daytime average residual noise levels); and
- Night: 45 dBA, L_{eq} (based on WHO and ETSU-R-97 Guidelines).

As the turbines would operate during both day and night, the night-time desired rating levels equates to an effective overall noise limit for operational noise of 45 dBA, L_{eq}.

13.2 Assessment of Potential Impacts

13.2.1 Construction Phase

Noise sources during construction would consist of the equipment and vehicles used in the construction process. Any noise from night-time activities is likely to be limited to a generator to maintain power to critical plant (pumps, security systems etc.). As the requirement for, and location of such plant is unknown, it has been assumed as a worst-case that their location may be at the closest point of infrastructure to each of the noise-sensitive developments under consideration.

Construction phase impacts have been determined for the closest noise-sensitive location to each construction activity, and are shown in Table 13.2.

Table 13.2: Predicted Construction Noise Levels, dBA, $L_{Req,T}$, Highlands South WEF

Activity	Location	Predicted Rating Level dBA, $L_{Req,T}$	Excess, dBA $\Delta L_{Req,T,}$		Impact Intensity	
			Day	Night	Day	Night
Construction of Tracks and Hardstanding	12	66	21	0	Very High	None
Excavation and Concreting of Turbine foundations	12	61	16	0	High	None
Turbine Erection	12	59	16	0	High	None
Generator	12	40	-5	5	None	Low

As can be seen from Table 13.2, potential impacts from construction of Highlands South WEF are generally of high intensity during the day, with the exception of the construction of tracks, which is potentially very high intensity and the generator of no intensity and of low intensity during the night. The duration of this effect would be limited, however, which is taken into account in the assessment of such effects.

Impact Phase: Construction
Potential impact description: Construction of Tracks and Hardstanding Detailed description of impact: 2 no. Tracked Excavators

1 no. Articulated Dump Truck
1 no. Bulldozer
1 no. Vibratory Roller
6 no. Haulage Trucks per hour

	Intensity	Extent	Duration	Status	Probability	Significance	Confidence
Without Mitigation	H	L	L	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			YES – impact is temporary during construction phase.				
Will impact cause irreplaceable loss or resources?			NO				
Can impact be avoided, managed or mitigated?			YES				

Mitigation measures to reduce residual risk or enhance opportunities:

- Acoustic enclosures/screens should be used to contain noise-generating/equipment;
- Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible;
- Plant and equipment covers and hatches should be properly;
- Silenced equipment should be used where possible;
- Plant should be turned off when not in use;
- Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms;
- The use of vehicle horns should be limited to emergency use only;
- Good public relations should be maintained with local residents that may be affected by noise from site operations.

Impact Phase: Construction

Potential impact description: Excavation and Concreting of Turbine Foundations
Detailed description of impact:
1 no. Tracked Excavator
1 no. Concrete Mixer Truck with pump and boom arm
2 no. Poker Vibrators
1 no. Dump Truck (tipping fill)
1 no. Roller (rolling fill)
1 no. concrete Batching Plant
1 no. Lorry
6 no. Haulage Trucks per hour

	Intensity	Extent	Duration	Status	Probability	Significance	Confidence
Without Mitigation	H	L	L	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			YES – impact is temporary during construction phase.				

Will impact cause irreplaceable loss or resources?	NO
Can impact be avoided, managed or mitigated?	YES
Mitigation measures to reduce residual risk or enhance opportunities: • Acoustic enclosures/screens should be used to contain noise-generating/equipment; • Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible; • Plant and equipment covers and hatches should be properly; • Silenced equipment should be used where possible; • Plant should be turned off when not in use; • Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms; • The use of vehicle horns should be limited to emergency use only; • Good public relations should be maintained with local residents that may be affected by noise from site operations.	

Impact Phase: Construction							
Potential impact description: Turbine Erection Detailed description of impact: 1 no. Wheeled Mobile Crane 1 no. Mobile Telescopic Crane 1 no. Diesel Generator 2 no. Torque guns 5 no. Haulage Trucks per hour (Turbine Delivery)							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	H	L	L	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			YES – impact is temporary during construction phase.				
Will impact cause irreplaceable loss or resources?			NO				
Can impact be avoided, managed or mitigated?			YES				
Mitigation measures to reduce residual risk or enhance opportunities: • Acoustic enclosures/screens should be used to contain noise-generating/equipment; • Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible; • Plant and equipment covers and hatches should be properly; • Silenced equipment should be used where possible; • Plant should be turned off when not in use; • Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms; • The use of vehicle horns should be limited to emergency use only; • Good public relations should be maintained with local residents that may be affected by noise from site operations.							

Impact Phase: Construction							
Potential impact description: Generator							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	L	L	L	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			YES – impact is temporary during construction phase.				
Will impact cause irreplaceable loss or resources?			NO				
Can impact be avoided, managed or mitigated?			YES				
Mitigation measures to reduce residual risk or enhance opportunities: None Required							

The good practice measures detailed below should be implemented to manage the effects of noise from works on site:

- Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens;
- Noise-generating plant should be located as far away from the noise-sensitive receptors as is feasible for the particular activity;
- Plant and equipment covers and hatches should be properly secured to ensure there are no loose fixings causing rattling;
- Silenced equipment should be used where possible;
- Plant should be turned off when not in use;
- Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms;
- The use of vehicle horns should be limited to emergency use only; and
- Good public relations should be maintained with local residents that may be affected by noise from site operations. Effective communication should be established, keeping local residents informed of the type and timing of works, particularly in relation to temporary activities which may generate additional levels of noise.

13.2.2 Operational Phase

Sources of noise during operation of a wind turbine are both mechanical (from machinery housed within the turbine nacelle) and aerodynamic (from the movement of the blades through the air). Modern turbines are designed to minimise mechanical noise emissions from the nacelle through isolation of mechanical components and acoustic insulation of the nacelle. Aerodynamic noise is controlled through the design of the blade tips and edges. In most modern wind turbines, aerodynamic noise is also restricted by control systems which actively regulate the pitch of the blades.

The majority of wind farms at planning stage do not have a preferred turbine model selected for installation; therefore a candidate turbine representative of a range of turbines has been selected to provide an appropriate estimate of noise levels. Once noise levels have been predicted at the potentially affected properties, compliance with noise limits can be assessed and design advice provided to ensure noise limits are met.

The candidate turbine for the purposes of the noise assessment is the Acciona AW132-3300, with an installed capacity of 3.3 MW, a rotor diameter of 132 m and a hub height of 84 m. These dimensions result in a tip height of 150 m, the maximum height in the range under consideration. The turbine is available in a standard configuration or in a noise-mitigated version with blade serrations and nacelle insulation.

In accordance with the GPG, an addition has been applied to the manufacturer's stated sound power level data to account for measurement uncertainties of 1.645 x uncertainty. The manufacturer's documentation states a typical uncertainty of up to 1 dB, therefore 1.6 dB has been added, as shown in Table 13.3 as 'Modelled Sound Power Level'.

Table 13.3: Manufacturers Noise Emission Data - Acciona AW132-3300

Wind Speed at 10m Height, ms^{-1}	**6**	**7**	**8**	**9**	**10**
Wind Speed at 84 m Height (Z_o = 0.05 m), ms^{-1}	8.4	9.8	11.2	12.6	14.0
Standard Configuration					
Manufacturer's Estimated Sound Power Level, dB L_{WA}	108.5	108.5	108.5	108.5	108.5
Modelled Sound Power Level, dB, L_{WA}	110.1				
Noise-Mitigated – with Blade Serrations and Nacelle Insulation					
Manufacturer's Estimated Sound Power Level, dB L_{WA}	106.0	106.0	106.0	106.0	106.0
Modelled Sound Power Level, dB, L_{WA}	107.6				

Table 13.4 details the predicted operational noise levels for the proposed Highlands South WEF. The excess of the predicted noise levels over the desired day and night rating levels and consequent impact intensity are also shown. Where '-' is shown, the predicted level is less than 20 dBA and no impact will occur.

Table 13.4- Predicted Operational Noise Levels, dBA, $L_{Req,T}$, Highlands South WEF

Location	**Predicted Rating Level dBA, $L_{Req,T}$**	**Excess, dBA $\Delta L_{Req,T,}$**		**Significance**	
		Day	**Night**	**Day**	**Night**
1	-	-	-	None	None
2	-	-	-	None	None
3	-	-	-	None	None
4	-	-	-	None	None
5	-	-	-	None	None
6	-	-	-	None	None
7	-	-	-	None	None
8	40	-8	4	None	Medium
9	41	-7	5	None	Medium
10	35	-13	-1	None	None
11	34	-14	-2	None	None
12	48	0	12	None	High

Location	Predicted Rating Level dBA, $L_{Req,T}$	Excess, dBA $\Delta L_{Req,T,}$		Significance	
		Day	Night	Day	Night
13	47	-1	11	None	High
14	45	-3	9	None	High
15	-	-	-	None	None
16	39	-9	3	None	Low
17	40	-8	4	None	Medium
18	37	-11	1	None	Low

As can be seen from Table 13.4, there would be no effects during the day at any of the receptors. At night there would be:

- No effects at 10 locations;
- Low effects at 2 locations (16 and 18);
- Medium effects at 3 locations (8, 9 and 17); and
- High effects at 3 locations (12, 13 and 14).

Impact Phase: Operation							
Potential impact description: Operation – Day Detailed description of impact: Wind Turbines, Wind Turbine Auxiliary Plant, Transmission Line and Substation							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	L	L	H	Negative	L	L	H
With Mitigation	L	L	H	Negative	L	L	H
Can the impact be reversed?			YES – Impact would be reversed after decommissioning				
Will impact cause irreplaceable loss or resources?			NO – Impact would be reversed after decommissioning				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: None Required							

Impact Phase: Operation							
Potential impact description: Operation – Night Detailed description of impact: Wind Turbines, Wind Turbine Auxiliary Plant, Transmission Line and Substation							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	H	L	H	Negative	M	H	H
With Mitigation	M	L	H	Negative	M	M	H
Can the impact be reversed?			YES – Impact would be reversed after decommissioning				

Will impact cause irreplaceable loss or resources?	NO – Impact would be reversed after decommissioning
Can impact be avoided, managed or mitigated?	YES
Mitigation measures to reduce residual risk or enhance opportunities: Use of noise-mitigated turbine model: The candidate turbine is available in a noise-mitigated configuration with blade trailing edge serrations and nacelle insulation, which would reduce noise emissions by 2.5 dBA. The turbines WTG41, TWG42, WTG43, WTG44, WTG 45, WTG46, WTG47, and WTG48 require to be installed in this configuration. It is understood that agreement may be possible with landowners that noise levels are acceptable and / or relocation of farmworkers at these locations, in which case the use of noise-mitigated turbines will not be necessary. Should a turbine model other than the candidate be installed, consideration should be given to the noise emission of that turbine model and appropriate mitigation included if necessary.	

13.2.3 Decommissioning Phase

Noise sources during decommissioning would be similar to, though fewer than, those during construction and the duration shorter. Effects during decommissioning would therefore be no greater than those during construction.

13.3 Conclusion

The level of impact of noise effects for the Highlands South WEF has been assessed as low during construction and decommissioning with mitigation; as low during day-time operation and as high during night-time operation for some locations without mitigation. Turbines WTG41 to WTG48 may therefore require mitigation in the form of installation of a noise-mitigated turbine model, or alternatively an agreement with the respective landowner to ensure the respective residences remain unoccupied for the duration of the activity.

14 HERITAGE, ARCHAEOLOGY AND PALAEONTOLOGY

14.1 Description of the Baseline Environment

14.1.1 Palaeontological aspects

The Highlands WEF project area is underlain by potentially fossiliferous bedrocks of the Lower Beaufort Group and younger superficial sediments of the Masotcheni Formation. Combined desktop and field studies of the project area show that in practice the bedrocks and superficial sediments here are generally are of low palaeontological sensitivity because scientifically important fossils (notably well-preserved vertebrate and vascular plant remains) are rare.

14.1.2 Archaeological aspects

Very little is known of the archaeology of this part of the Eastern Cape as little systematic work has been done. The Albany Museum in Grahamstown holds stone artefacts from the Craddock area that were donated by members of the public from as early as the 1880s. Some of these collections derive from freshwater mussel middens containing stone artefacts and pottery from the banks of the Great Fish River.

The majority of observations from this region come from the Cookhouse/Bedford area – some 45 km east of Somerset East. There, surveys have documented numerous occurrences of Early (ESA), Middle (MSA) and Late Stone Age (LSA) archaeological material and a range of more recent heritage resources such as farm houses (sometimes fortified),

ruins, sheds, stone kraals, historic refuse middens, farm cemeteries, unmarked graves and stone cairns.

14.1.3 Historical aspects

The following list indicates the dates at which the various farms in the study area were first surveyed and granted:

- Lekker Water 101 (SG 469/1816) was surveyed in 1816 and first granted to Jurgens Potgieter in May 1818.
- Rietfontein 102 (SG 2588/1940) represents the consolidation of various portions of other farms, including Lekkerwater (first granted to JJ Potgieter in 1818).
- Spaarwater 103 was surveyed in 1816 and originally granted to JJ Potgieter in May 1818.
- Coetzees Fontein 104 (SG 479/1816) was surveyed in 1816 and first granted to Laurens Erasmus in 1818. Subsequently in 1860, it was surveyed again for Joshua Norden. The new boundaries show a public road bisecting the property, and a house on the land.

Many of the farms in the area, were surveyed relatively early (1816) and there is a high possibility of significant early farm buildings in the area, as well as farm cemeteries. Halkett et al. (2010) recorded many significant heritage buildings in the area south of Bedford.

14.1.1 Summary of the Heritage indicators

Findings of the heritage study is broadened in the Heritage Impact Assessment (Volume II). Fossils were located in several places in the northern half of the study area but sensitive locations are not impacted by turbine placements. In general the project area is largely of low palaeontological sensitivity. Precolonial and colonial traces are quite common on the landscape but are strongly tied to the valleys where water and good soil can be obtained. These areas are away from the proposed developments. There are, however, occasional scatters of ESA and/or MSA artefacts located on the exposed hills which could be impacted by the proposed developments. The majority of these resources are likely to be of very low cultural significance and of no further concern. Graves, buildings and other historical resources are also concentrated in river valleys and should not generally be an issue.

The cultural and natural landscape would be impacted but, given the fact that the proposed projects lie within a REDZ, it is expected that a new 'electrical layer' will be added to the landscape over time.

14.2 Assessment of the Potential Impacts

- No assessment of impacts to built heritage resources is included because no impacts are expected.
- Impacts to archaeological resources and/or graves would only occur during the construction phase and thus no assessments for operation and decommissioning are provided.
- Impacts to the cultural landscape remain consistent throughout the lifespan of the project and would only cease after the decommissioning phase is complete and the land rehabilitated. The cultural landscape impact assessments provided thus cover construction, operation and decommissioning.
- Further significant impacts on fossil heritage during the operational and decommissioning phases of the wind farm are not anticipated, so these phases are not separately assessed here.

Impact Phase: Construction Phase
Impact description: Impacts on archaeological resources

Archaeological resources may be damaged or destroyed during clearing of the ground or excavation of foundations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No, once archaeological artefacts are disturbed/destroyed the site cannot be recreated.						
Will impact cause irreplaceable loss or resources?	Yes, heritage resources are regarded as unique.						
Can impact be avoided, managed or mitigated?	Yes, it is often easy to realign a section of road if needed but, if this is not possible then archaeological mitigation can be easily effected (there are no identified no-go areas within the present footprint).						
Mitigation measures: • Commission an archaeological walk-through survey to identify sites within final footprint • Carry out any archaeological mitigation for sites of cultural significance that cannot be avoided							

Impact Phase: Construction Phase							
Impact description: Impacts on graves Graves may be damaged or destroyed during clearing of the ground or excavation of foundations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	M	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No, once graves are disturbed/destroyed they cannot be recreated.						
Will impact cause irreplaceable loss or resources?	Yes, every grave is unique.						
Can impact be avoided, managed or mitigated?	Yes, it is often easy to realign a section of road if needed but, if this is not possible then exhumation can be effected (avoidance is strongly preferred).						
Mitigation measures: • Commission an archaeological walk-through survey to identify graves within final footprint • Carry out exhumation of graves that cannot be avoided							

Impact Phase: Construction / Operational and Decommissioning Phase							
Impact description: Impacts to the cultural landscape The cultural landscape would be altered through the addition of a new 'layer' comprising of large wind turbines and related infrastructure.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	H	H
With Mitigation	M	M	M	Negative	M	H	H
Can the impact be reversed?	Yes, if the facility is decommissioned and the land rehabilitated then the impacts would cease.						

Will impact cause irreplaceable loss or resources?	No, because there are many other areas with very similar cultural landscape character.
Can impact be avoided, managed or mitigated?	No, it is not possible to avoid the impacts. However, mitigation measures can very slightly reduce the severity of impacts.

Mitigation measures:

- Minimise cut and fill operations
- Minimise unnecessary surface disturbance
- Ensure effective rehabilitation of the development area after construction and again after decommissioning
- Further measures would be as described by the visual assessment practitioner.

Impact Phase: Construction Phase

Impact description: Palaeontological heritage resources

Destruction, disturbance or damage of fossils preserved at or below the surface of the ground due to surface clearance and excavations during the construction phase (*e.g.* for wind turbine footings, access roads, hard standing & laydown areas, building foundations).

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	L	Negative	M	M	M
With Mitigation	L	H	L	Negative	L	L	M

Can the impact be reversed?	No, lost fossils cannot be re-created while disturbance leads to permanent loss of contextual scientific data.
Will impact cause irreplaceable loss or resources?	Possible, but unlikely. Most fossils are of widespread occurrence within the outcrop area of a given rock unit outside the project area. However, loss of unique, rare or exceptionally-preserved specimens cannot be discounted.
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- Monitoring of all substantial excavations (e.g. wind turbine foundations) by ECO for fossil material on an on-going basis during construction phase.
- Application of Chance Fossil Finds Procedure (See Appendix 2 of the Specialist Report in Volume II): safeguarding new fossil finds and reporting to ECPHRA by ECO for possible recording and sampling / collection by professional palaeontologist.

14.3 Conclusion

The fieldwork conducted shows that archaeological resources could be found almost anywhere in the Proposed Development Area but that the vast majority are likely to be of low cultural significance. Aside from impacts to the cultural landscape which are unavoidable but only of generally medium significance, no other aspects of heritage are expected to be impacted. Although a further survey will be required prior to the commencement of construction, it is considered highly unlikely that heritage resources that would require avoidance will be found. Rather, it is likely that some archaeological mitigation may be needed for any resources that cannot be avoided. Such mitigation can be easily effected where required.

15 VISUAL

15.1 Description of the Baseline Environment

The Highlands site is a gently undulating upland area at about 1100 m elevation. The region to the north of the R63 Route becomes much more mountainous, where the *Groot Bruintjieshoogte* range overlooks the site, with a short pass on the R63. The western part of the site, including the scarp with its steeper slopes, has been incised by the *Voëlrivier* and its tributaries, and the eastern part by the *Brakrivier* and its tributaries.

The geology has a primary influence on landforms, and the character of the landscape, or 'sense of place'. The geology of the Highlands site consists of mudstones and sandstones of the Adelaide Formation, Beaufort Group, which forms part of the extensive Karoo Supergroup. The dolerite dykes and sills, which intruded the area are responsible for many of the peaks and ridges in the general area.

The rugged west-facing escarpment consists of Camdeboo Escarpment Thicket, a 2 to 3 m succulent thicket, with *Portulacaria afra* (spekboom) dominant, as well as aloe species. The eastern part of the site consists of Bedford Dry Grassland, an open dry grassland interspersed with *Acacia karoo* woodland, especially in the drainage lines. (Mucina and Rutherford, 2006). Copses of exotic shade trees (pine, wattle, palms) have historically been planted around the farmsteads. Invasive prickly pear and sisal plants are also common.

The study area has a pleasing rural character with green pastures grazed by cattle and sheep (including mohair producers), interspersed by crops and woodland along the alluvial stream courses. There are numerous farmsteads, both on the site and in the immediate surroundings. These range from about 2.5 to 7.5 km apart.

The low escarpment, which runs along the western side of the site is the main scenic feature of the study area. The skyline of the escarpment edge is considered to be particularly visually sensitive. Any turbines located on the scarp edge would tend to be seen in silhouette against the sky. A parcel of land on the western border of the site forms part of the Mountain Zebra-Camdeboo Protected Environment (PE), managed by a PE Landowners Association. The PE parcel is on a south-west facing slope of the scarp face, and is therefore orientated away from the proposed wind farms. The parcel is not known to have any tourism facilities that could be affected by the proposed wind farms. The remaining upland, covered mainly in grassland, tends to be visually exposed, and wind turbines would be potentially visible over long distances.

There are a number of game farms and tourist facilities in the general area, such as East Cape Safaris at Kaalplaas, Kamala Game Reserve - also indicated as Kampala Game Reserve on maps, Vaalklip Game Farm and Side by Side Safaris.

Other receptors are travellers on the R63 Route, which runs across the northern portion of the site, and includes the Bruintjieshoogte Pass, with roadside view sites.

Visibility

Degrees of visibility are listed below, but may be subject to foreground topography and the number of turbines that are visible.

- High: Prominent feature within the observer's viewframe 0-2.5km
- Mod-high: Relatively prominent within observer's viewframe 2.5-5km
- Moderate: Only prominent with clear visibility as part of the wider landscape 5-10km
- Marginal: Seen in very clear visibility as a minor element in the landscape 10-20km

Visual Exposure

Visual exposure of the proposed development is determined by the geographic area within which the project would be visible. The turbines would be located on a visually exposed upland. Some areas to the north and west would be in a view shadow, and therefore not affected by the wind farms.

Landscape Integrity

Visual quality tends to be enhanced by scenic or rural intactness of the landscape, as well as absence of other visual intrusions. The Proposed Development would partly alter the character of the landscape, although farming could continue.

Visual Sensitivity

The low escarpment along the western edge is a scenic feature, particularly when seen from the R63 and Bruintjieshoogte Pass. Sensitive features and receptors are indicated on Figures 15.1, 15.2, 15.3,15.4, and overall visual sensitivity is indicated on Figure 15.5.

Cultural landscapes, such as the farmsteads in the surroundings, generally form part of a separate heritage study, but are important in that they may be visually sensitive.

Visual Absorption Capacity (VAC)

This is the potential of the landscape to screen the wind farms from view. The upland site is gently undulating, and therefore visually exposed, i.e. has low visual absorption capacity. The area to the north of the R63 is partly screened by the *Bruintjieshoogte* range.

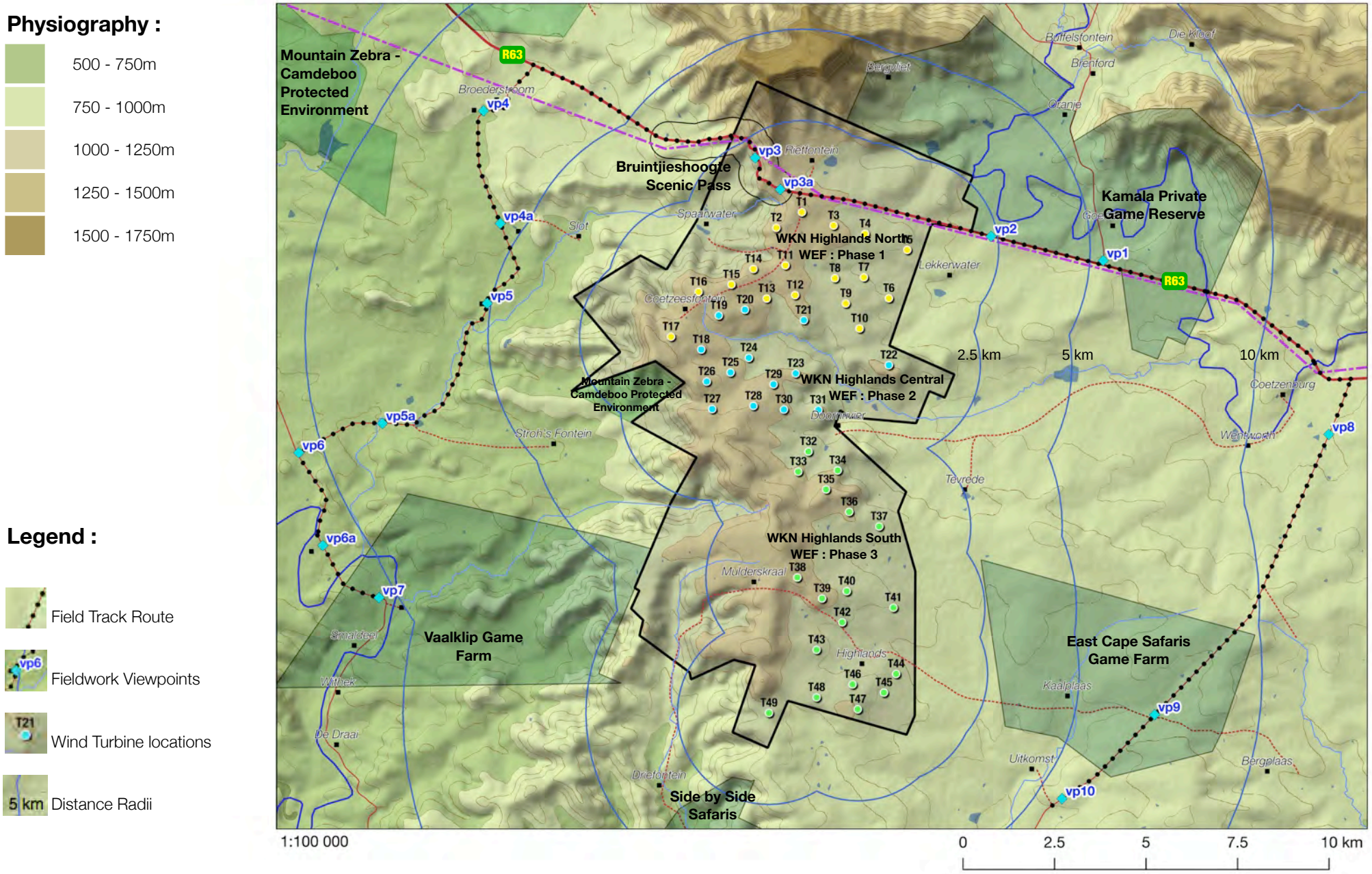
The overall visual impact intensity is assessed in Table 15.1 below, using the criteria described above.

***Table 15.1:* Visual Impact Intensity (severity): Wind Farms**

Visual Criteria	Comments	South WEF
Visibility of turbines (distance)	Visible from R63, farmsteads, game farms.	Medium
Visibility of lights at night	Navigation lights on turbines, security lighting at substation/s, O&M buildings.	Medium
Visual exposure (viewshed)	Exposed upland, partly screened by landforms mainly to the north and west.	Medium
Landscape integrity (rural intactness)	Rural cattle farming character.	Medium
Landscape sensitivity (features, receptors)	Escarpment, R63 / *Bruinjieshoogte* Pass, Protected Environment.	Medium
Visual absorption capacity	Visually exposed upland plateau, with some screening by topography.	Med-High
Overall impact intensity	Summary	**Medium**

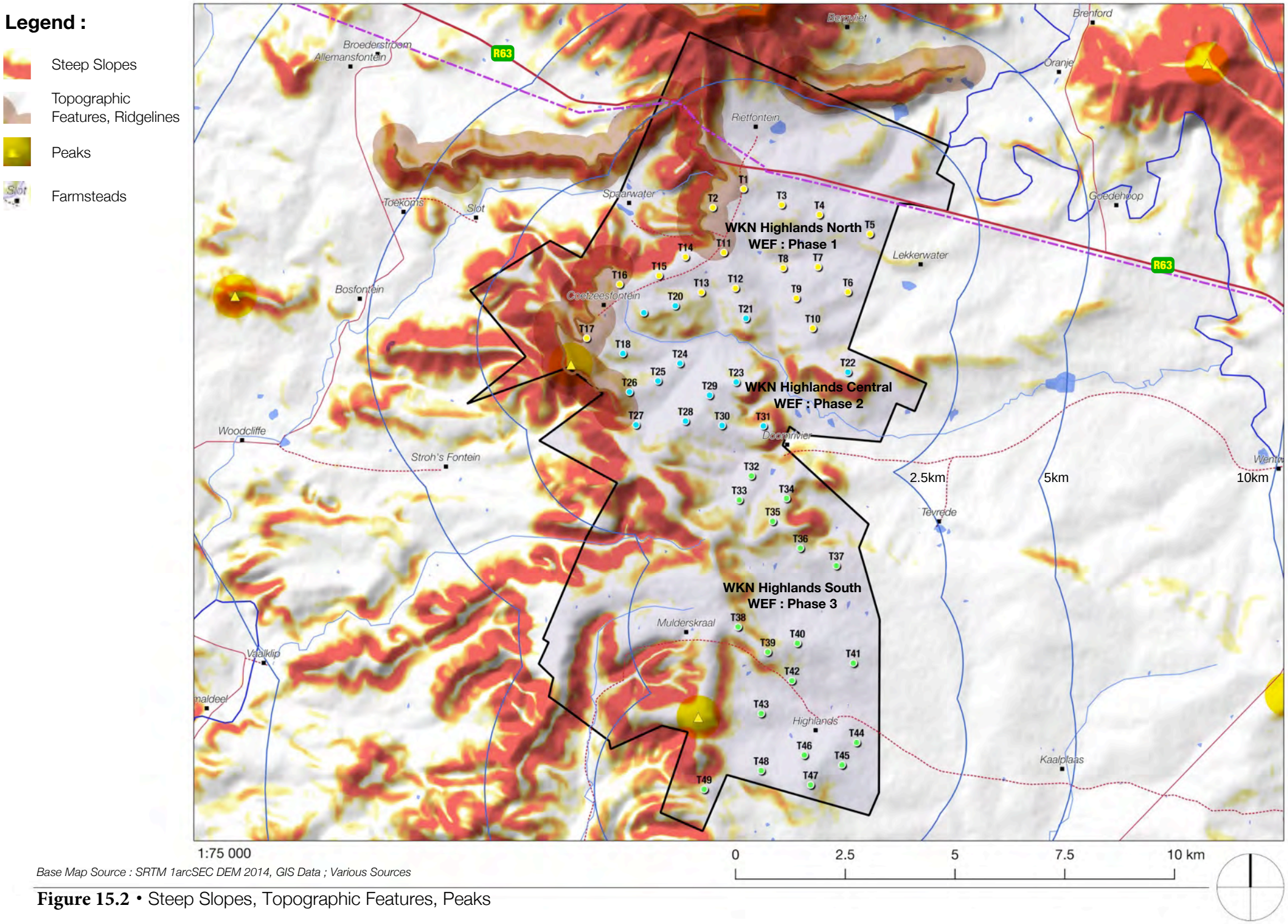
15.2 Assessment of Potential Impacts

Impact Phase: Construction Phase
Impact description: Potential visual effect of construction activities, including cranes, construction traffic, dust and noise affecting the rural sense of place.



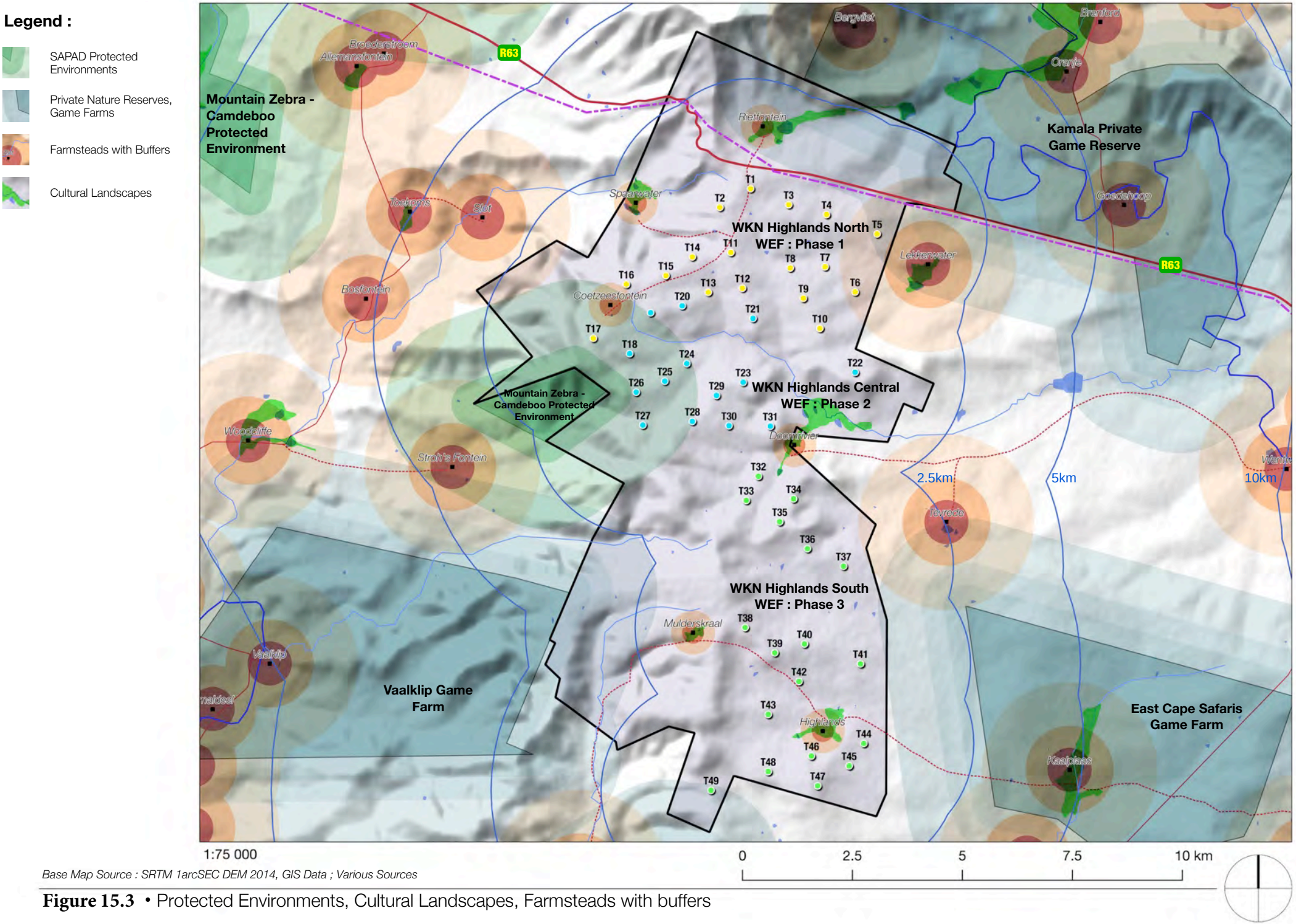
Base Map Source : SRTM 1arcSEC DEM 2014, GIS Data ; Various Sources

Figure 15.1 • Physiography with 50m contours, Fieldwork and Viewpoints



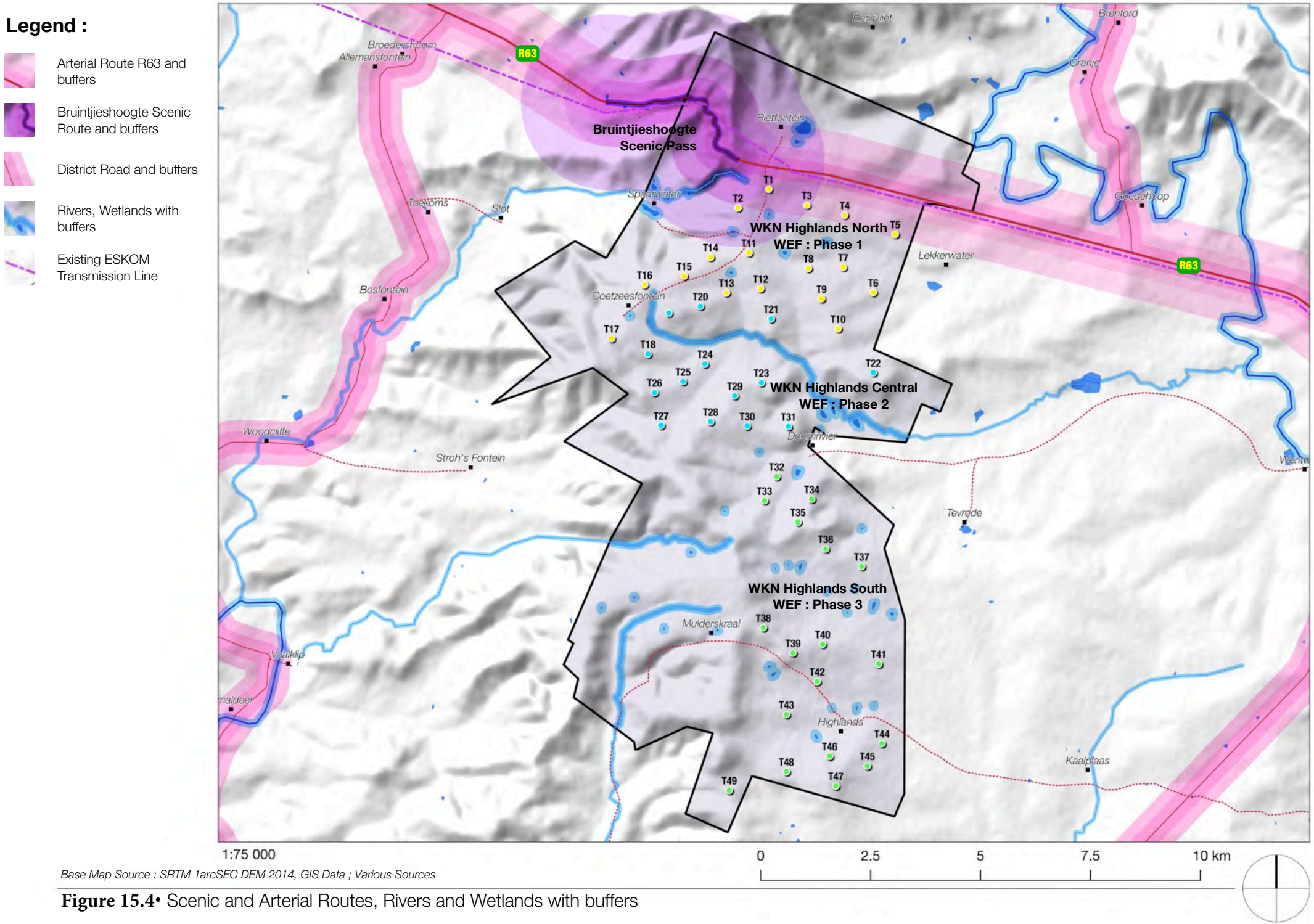
Base Map Source : SRTM 1arcSEC DEM 2014, GIS Data ; Various Sources

Figure 15.2 • Steep Slopes, Topographic Features, Peaks



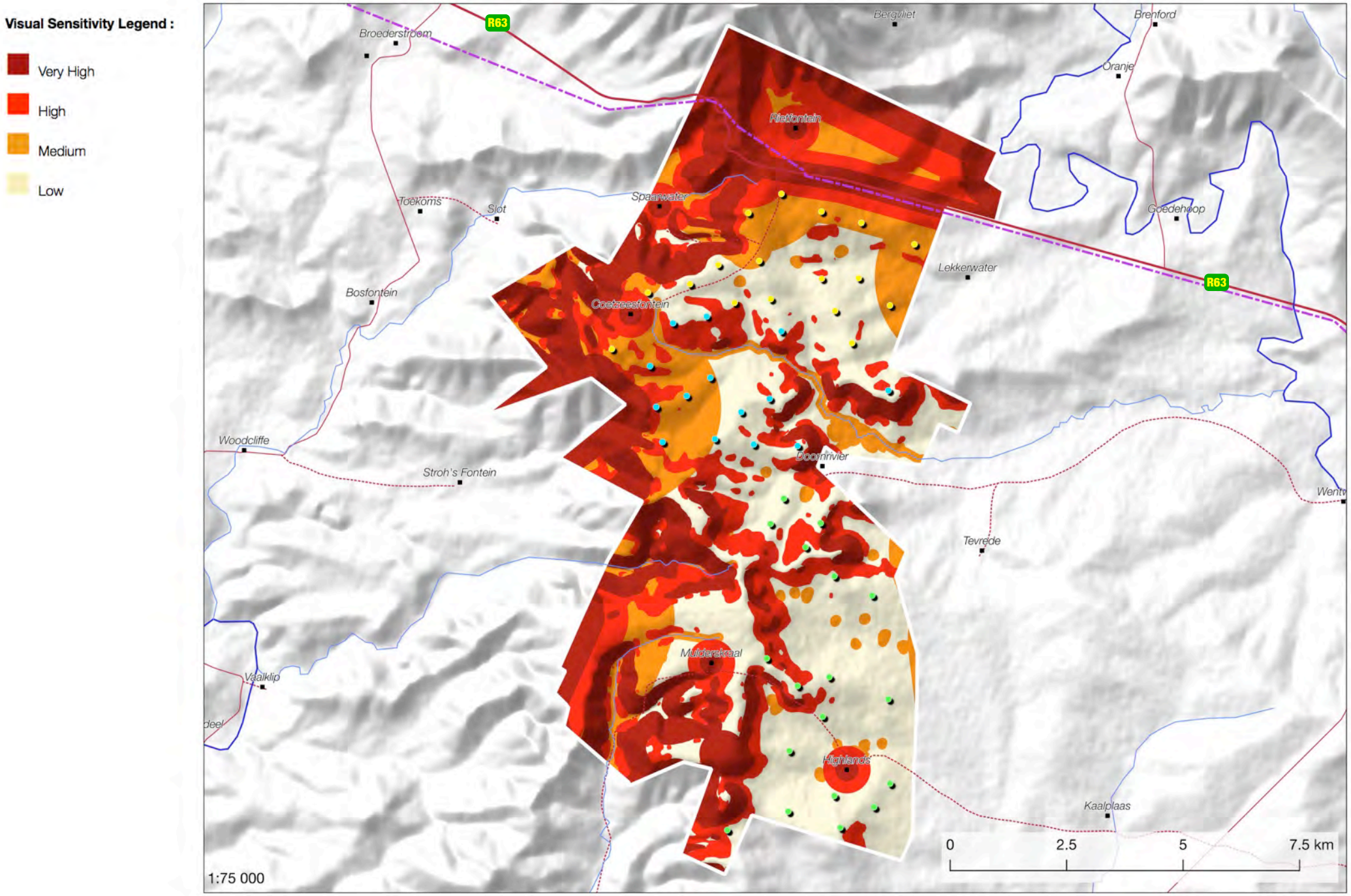
Base Map Source : SRTM 1arcSEC DEM 2014, GIS Data ; Various Sources

Figure 15.3 • Protected Environments, Cultural Landscapes, Farmsteads with buffers



Base Map Source : SRTM 1arcSEC DEM 2014, GIS Data ; Various Sources

Figure 15.4• Scenic and Arterial Routes, Rivers and Wetlands with buffers



Base Map Source : SRTM 1arcSEC DEM 2014, GIS Data ; Various Sources

Figure 15.5 • Highlands Visual Sensitivity

- The construction activities would be highly visible (within 2,5km) for a section of the R63, the *Bruintjieshoogte* Pass and Lekkerwater farmstead.
- The construction activities would be moderately visible (within 10km) of about 10 farmsteads in the area.
- The construction activities would be mainly local in scale but could extend further along the arterial routes in terms of heavy-duty trucks.
- The activities would be of short term duration.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	M	Negative	M	H	H
With Mitigation	L	L	M	Negative	M	M	M

Can the impact be reversed?	Yes, through site rehabilitation.
Will impact cause irreplaceable loss or resources?	No, areas disturbed by construction activities can be rehabilitated.
Can impact be avoided, managed or mitigated?	Yes, some mitigation has already been achieved through careful siting of wind turbines in response to specialist studies. Further mitigation can be achieved through careful siting and visual screening of related infrastructure. Visual mitigation is possible through careful siting of the construction camp and stockpiles, as well as visual screening.

Mitigation measures:

- Substation and O&M buildings to be located in visually unobtrusive positions, or alternatively screened with earth berms and planting.
- Location of the construction camp, batching plant and related storage/stockpile areas in unobtrusive positions in the landscape, away from arterial or district roads, or alternatively screening measures utilized.
- Clear demarcation of construction camps, limited in size to only that which is essential.
- Employment of dust suppression and litter control measures. Formulation and adherence to an Environmental Management Programme (EMPr), monitored by an Environmental Control Officer (ECO).
- Areas disturbed during construction to be rehabilitated to original state.

Impact Phase: Operational Phase

Impact description: Potential visual intrusion of wind turbines, assembly pads, access roads, substation, and operations/maintenance buildings on the rural landscape.

- Navigation lights on the turbines and security lighting at the substation would be visible at night.
- The construction activities would be moderate to highly visible (within 5km) from 4 farmsteads, and only moderately visible (within 10km) for a section of the R63, the *Bruintjieshoogte* Pass and 1 farmstead.
- The wind farm would be local in scale, beyond the site. Navigation lights visible over longer distances.
- The visual intrusion of the wind farm would be of long term duration, but is reversible.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	H	M	Negative	M	M	M

Can the impact be reversed?	Yes, but only over the long term through decommissioning.
Will impact cause irreplaceable loss or resources?	No, scenic resources would be restored after decommissioning in the long term.
Can impact be avoided, managed or mitigated?	Yes, some mitigation has already been achieved through careful siting of wind turbines in response to specialist studies. Lighting and signage can be managed.

Mitigation measures:

- Positioning of turbines has already been mitigated through iterative layouts based on specialist studies.
- Navigation lights to be to Civil Aviation Authority requirements.
- Lighting at substations and O&M buildings to be minimised through use of reflectors, low-level bollard lights and movement sensors so that lights only come on when required.
- Signage to be minimised as far as practical, and billboard type signs avoided.

Impact Phase: Decommissioning Phase							
Impact description: Potential visual intrusion of remaining structures, platform earthworks and access roads on the rural landscape.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Yes, through the removal of structures and rehabilitation of the site.						
Will impact cause irreplaceable loss or resources?	No, the landscape would be restored after rehabilitation.						
Can impact be avoided, managed or mitigated?	Yes, through the removal of structures and rehabilitation of the site.						
Mitigation measures: • Turbines and above-ground structures to be demolished or recycled for new uses. • Access roads no longer required to be ripped and regraded. • Exposed or disturbed areas revegetated for grazing pasture or natural vegetation to blend with surroundings.							

The potential visual impact significance of the proposed Highlands South WEF during construction would be medium, and could be medium during the operation phase. Required mitigation has already been implemented through siting of the wind turbines in response to the specialist studies.

The layout of the proposed turbines succeeds in avoiding practically all the major visual constraints for the study area, occupying the least sensitive parts of the site.

The fact that the proposed wind farms could potentially be dismantled during the decommissioning phase in the long term, and the site restored to more or less its original state, is a positive consideration.

16 SOCIAL

16.1 Description of the Baseline Environment

The proposed Highlands WF is located in the Blue Crane Route Local Municipality (BCRLM), within the Eastern Cape Province in the Sarah Baartman District Municipality (SBDM), previously known as the Cacadu District Municipality (DM).

The main settlements in the municipality are Somerset East, which serves as the administrative and commercial centre, Cookhouse and Pearson. The most significant roads passing through the area are the N10, R61, R63, and the R390.

16.1.1 Provincial Socio-Economic Context

The Eastern Cape Province faces significant social challenges: namely, addressing poverty, income inequality, food insecurity, and unemployment.

Population

According to the 2011 census, the province was home to 6.7 million people, which constituted 12.7% of the national population. The Province's population grew by 4.5% between 2001 and 2011. In terms of population the SBDM makes up 7% of the provinces total population. It is also important to note that youth constitute the largest share of the population in all DMs.

Poverty and inequality

The Eastern Cape Province had the highest poverty levels in South Africa in 2011. Within the province itself the SBDM was ranked the second best in terms of poverty levels.

In terms of inequality, South Africa is one of the most unequal societies in the world. The inequality level in the SBDM was marginally higher than the national figure in 2011. Income equality however, remains a major challenge facing the Eastern Cape Province.

Food security

The Eastern Cape has one of the highest levels of food insecurity in South Africa. According to the estimates, about 78% of the households in the province may be classified as food insecure. This is significantly higher than national average. Vulnerability to food insecurity is widespread. Food insecurity is relatively lower in the SBDM (66%-71%). Within the SBDM the food insecurity levels in the BCRLM are between 40-60% of households, which makes the BCRLM one of the least food-insecure LMs in the DM.

Economic Performance

The Eastern Cape Province accounted for 7.8% of the national GDP in 2011 making it the fourth largest economy in South Africa. The most important sector in the Eastern Cape economy is the tertiary sector, which contributed 76.7% of the regional GDP, followed by the secondary sector (21.2%), and the primary sector (2.2%). Within the tertiary sector the most important sub-sectors were finance, real estate and business services (22.4%), general government services (21.2%) and wholesale and retail trade (13.8%). Within the Secondary Sector the most important sub-sectors were manufacturing (17.5%), followed by construction (2.6%). The most important sub-sector in the Primary Sector was agriculture, forestry and fishing (2.1%) followed by mining and quarrying (0.1%). I

Employment

In terms of employment a total of 1.3 million people were employed in the Eastern Cape in 2011, which makes up 9.7% of the total number of people employed in the whole country. The rate of unemployment in the province increased from 28.2% in the 3rd Quarter of 2011 to 30% in the 3rd Quarter of 2012, an increase of 1.8 percentage points. This is despite a 2.5% increase in employment. This simultaneous increase in both the unemployment rate and employment levels is explained by an increase in the total size of the labour force (by 5%), in excess of the increase in the total number of new jobs.

In terms of key sectors, more than 60% of the 1.3 million people employed in the province in the third quarter of 2012 were employed in three sub-sectors, namely, government, social and personal services (26.1%), wholesale and retail (23.5%), and manufacturing (12.2%). The primary sectors, comprising mining and quarrying (0.1%) and agriculture, forestry, hunting and fisheries (4.5%) employed far fewer numbers of people. The role of agriculture, forestry, hunting and fisheries sub-sector in terms of employment has fallen significantly since 2002. The share of agriculture, forestry, hunting and fisheries declined to 4.5% from 21.1%, a significant decline of 16.6 %. During the same period all of the other sub-sectors reported an increase in their contribution to employment.

In terms of employment by occupation category, in 2008, elementary occupations made up of 28.4% of total employment, followed by service workers and shop and market sales

at 13.4% and technical and associate professionals at 11.4%. In 2011, elementary activities decreased to 24.1% while employment in service workers and shop and market sales workers as well as technical and associate professionals increased respectively to 14.9% and 14.4%. Between the two years, employment declined in the unskilled job categories while employment in the semi-skilled and skilled categories increased – evidence of skill-biased employment growth. This reflects the decrease in the contribution of the agriculture, forestry, hunting and fisheries sectors which would have employed a large number of unskilled workers.

The key employment sectors in the SBDM were Community Services (~24%), Trade (~23%) and Agriculture (~22%). However, while the contribution towards employment in the Community Services and Trade sectors increased between 2002 and 2011, the contribution of the Agriculture sector declined significantly over the same period.

The Manufacturing sector also accounted for sizable proportion of employment in the province. However, total employment in manufacturing significantly declined in the metros between 2002 and 2011. The share of agriculture in total employment also declined in all the metros and DMs for the same period. The decline was significant in the SBDM (~10.8%), where it is a relatively important economic activity.

16.1.2 Municipal – level Socio-Economic Context

Population

The population of the Blue Crane Route Local Municipality (BCRLM) increased from 35 407 in 2001 to 36 002 in 2011, which represents a marginal increase of ~0.1% and an annual average increase of 0.17%. SBDM increased from 388 206 in 2001 to 450 584 in 2011 (~16%) over the same period, with an annual increase of ~1.49%.

The majority of the population in the BCRLM in 2011 was Black African (59%), followed by Coloured (33%) and Whites (6.8 %). The dominant languages within the Municipality are isiXhosa (50.1%), Afrikaans (42.2%) and English (3.3%).

Education

The education levels in both the SBDM and BCRLM improved for the period 2001 to 2011, with the percentage of the population over 20 years of age with no schooling in the SBDM decreasing a high of 19.8% to 10.5%. The percentage of the population over the age of 20 with matric also increased in both the SBDM and BCRLM, from 11.7% to 18.9% in the BCRLM. Despite these increases the figures are significantly lower than the national (28.4%) average. Low education levels, specifically higher education, therefore remains a challenge in both the SBDM and BCRLM.

16.1.3 Municipal Service Levels

Access to municipal services as measured in terms of flush toilets, refuse removal, piped water and electricity, increased in both the SBDM and BCRLM for the period 2001 to 2011. The service levels in the SBDM and BCRLM are also higher than the provincial and national averages for each of the municipal service categories. The improvement in service levels therefore represents a positive socio-economic improvement over the ten year period between 2001 and 2011.

16.1.4 Local Economy

The most important economic sectors in the SBDM are Community Services (36%), Trade (18%) which includes tourism, Finance (17%) which includes Real Estate, Agriculture (7%), Manufacturing (7%) and Transport (7%) (Figure 16.1).

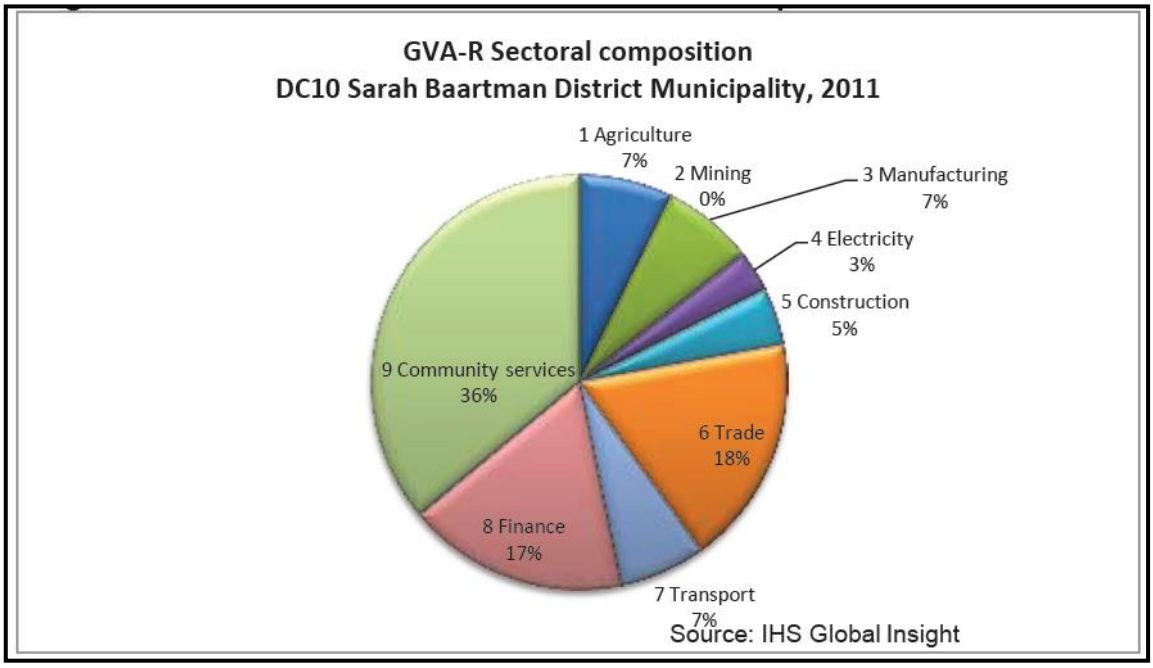


Figure 16.1: Sarah Baartman DM GVA-R Sector composition

The SBDM IDP identifies the agriculture and tourism sectors as the sectors that have the greatest potential for economic development.

The IDP also notes that opportunities exist in the renewable energy sector. In this regard the IDP refers to the development of a number of wind generation initiatives in the SBDM, noting that eight of the thirteen approved wind farm developments in South Africa are located in the district. In addition, the Blue Crane Route region has been identified by the National Department of Environmental Affairs as one of three potential wind generation 'preferred locations' in the country.

The economy of the BCRLM is largely based on agriculture. The key economic activities include intensive farming operations (cash crops, lucerne, dairy etc.), extensive farming operations (cattle, sheep, goats and game farming) with the agricultural sector contributing 28% of all value added and accounting for 41% of formal employment.

The IDP notes that while the agriculture sector is a key sector its' role has declined in recent years. Manufacturing has also shown relatively weak growth over the past seven years and appears to have been hard hit by the recession of 2008. Construction growth has also been highly cyclical with a progressive decline over the past four years. In terms of growth sectors Trade (which includes retail and tourism) has shown consistently positive growth since 2009 and appears to have recovered rapidly after the recession. Transport has also shown consistently positive growth and rapid recovery after the recession. After a notable pre-recession property boom, finance (which includes real estate) is indicating positive growth once more. Community Services has also shown consistently positive growth since 2002. The IDP also notes that while tourism spend has shown rapid growth over recent years is appears to have flattened out in recent years. In this regard there has been a decline in the number of international and domestic tourists since 2009. Despite the decline the tourism sector has been identified as an important growth sector. The renewable energy sector is also regarded as an important growth sector.

The BCRLM has also identified the need to broaden the local economy through the establishment of a strong industrial sector in smaller rural towns in order to create employment opportunities and make these towns more sustainable. The initiative to develop a stronger industrial sector is linked to the lack of value adding. In this regard the

BCRLM IDP notes that the majority of the agricultural products are exported in their raw form with limited values adding. The IDP identifies the need to establish a local industrial cluster with the required facilities to address this issue

16.2 Policy and Planning Context

Legislative and policy context 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.

For the purposes of the meeting the objectives of the SIA the following national, provincial and local level policy and planning documents were reviewed, namely:

- National Energy Act (2008);
- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- White Paper on Renewable Energy (November 2003);
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- The National Development Plan (2011);
- New Growth Path Framework (2010);
- National Infrastructure Plan (2012);
- Strategic Environmental Assessment for wind and solar energy in South Africa (CSIR, 2015);
- Eastern Cape Provincial Growth and Development Strategy (2004-2014);
- Sarah Baartman District Municipality Integrated Development Plan (2015/2016 Review);
- Sarah Baartman District Municipality Spatial Development Framework (2013);
- Northern Cape Spatial Development Framework;
- Blue Crane Route Local Municipality Integrated Development Plan (2015/2016 Review).

The findings of the review indicated that renewable energy is strongly supported at a national, provincial and local level (more in depth review can be seen in the Social Impact Assessment Report, Volume II). The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Eastern Cape Provincial Growth and Development Plan (ECPGDP), The Sarah Baartman District Municipality Integrated Development Plan (IDP) and the Blue Crane Route Local Municipality Integrated Development Plan (IDP). The site is also located in a Renewable Energy Development Zone (REDZ). The general area has therefore been identified as suitable for the establishment of renewable energy facilities. However, there is a need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the areas tourism potential. In this regard the area to north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF.

16.3 Wind Energy Related Impacts

In this section, the typical issues / impacts related to the establishment of a WEF and associated infrastructure (such as on-site substations and power lines) are discussed. It is important to note that over the next few years several WEFs (including substations and power lines) are likely to be constructed in South Africa. The development and associated environmental assessment of WEFs in South Africa is relatively new, and thus it is valuable to draw on international experience. This section of the report therefore draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with WEFs and associated infrastructure such as

on-site substations and power lines. It should be noted that the section is not specific to the site but merely a review of international literature.

16.3.1 Health Related Impacts

The potential health impacts typically associated with WEFs include, noise, dust, shadow flicker and electromagnetic radiation. The findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation, and may therefore in fact result in the minimization of adverse health impacts for the population as a whole (WHO, 2004).

The overall conclusion of the review undertaken by the Australian Health and Medical Research Council (July, 2010) is that, based on current evidence, wind turbines do not pose a threat to health if planning guidelines are followed.

16.3.2 Wind Turbine Generators

The height of the turbines and the fact that a WEF comprises a number of these turbines distributed across the site would result in the development typically being visible over a large area.

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a WEF, with less opposition being encountered when fewer turbines are proposed. Certain objectors to wind energy developments also mention the "sky space" occupied by the rotors of a turbine. As well as height, "sky space" is an important issue. "Sky space" refers to the area in which the rotors would rotate.

The visual prominence of the development would be exacerbated within natural settings, in areas of flat terrain or if located on a ridge top. Even dense stands of wooded vegetation are likely to offer only partial visual screening, as the wind turbines are of such a height that they will rise above even mature large trees.

16.3.3 Shadow Flicker

Shadow flicker is an effect which is caused when shadows repeatedly pass over the same point. It can be caused by wind turbines when the sun passes behind the hub of a wind turbine and casts a shadow that continually passes over the same point as the rotor blades of the wind turbine rotate (http://www.ecotricity.co.uk).

The effect of shadow flicker is only likely to be experienced by people situated directly within the shadow cast by the rotor blades of the wind turbine. As such, shadow flicker is only expected to have an impact on people residing in houses located within close proximity of a wind turbine (less than 500m) and at a specific orientation, particularly in areas where there is little screening present. Shadow flicker may also be experienced by and impact on motorists if a wind turbine is located in close proximity to an existing road. The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking the orientation of the turbines relative to the nearby houses and the latitude of the site into consideration. Tall structures and trees will also obstruct shadows and prevent the effect of shadow flicker from impacting on surrounding residents (http://www.ecotricity.co.uk).

16.3.4 Motion Based Visual Intrusion

An important component of the visual impacts associated with wind turbines is the *movement* of the rotor blades. Labelled as motion-based visual intrusion, this refers to the inclination of the viewer to focus on discordant, moving features when scanning the landscape. Evidence from surveys of public attitudes towards WEFs suggest that the

viewing of moving rotor blades is not necessarily perceived negatively (Bishop and Miller, 2006). The authors of the study suggest two possible reasons for this; firstly when the turbines are moving they are seen as being 'at work', 'doing good' and producing energy. Conversely, when they are stationary they are regarded as a visual intrusion that has no evident purpose. More interestingly, the second theory that explains this perception is related to the intrinsic value of wind in certain areas and how turbines may be an expression or extension of an otherwise 'invisible' presence.

Famous winds across the world include the Mistral of the Camargue in France, the Föhn in the Alps, or the Bise in the Lavaux region of Switzerland. The wind, in these cases, is an intrinsic component of the landscape, being expressed in the shape of trees or drifts of sands, but being otherwise invisible. The authors of the study argue that wind turbines in these environments give expression, when moving, to this quintessential landscape element. In a South African context, this phenomenon may well be experienced if wind farms are developed in areas where typical winds, like berg winds, or the south-easter in the Cape are an intrinsic part of the environment. In this way, it may even be possible that wind farms will, through time form part of the cultural landscape of an area, and become a representation of the opportunities presented by the natural environment.

16.3.5 Landscape Impacts

Landscapes change over time, both naturally and through human intervention. In addition, landscape values, being subjective, change not only with time, but also from person to person. As a result, there are a wide variety of opinions of what is valued and what is not. The perceptions by which we value landscapes are influenced by a range of factors such as visual, cultural, spiritual, environmental, and based on memories or different aesthetics.

The social specialist notes (Volume II) 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 wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact.

Cumulative impacts may be visual and aesthetic, but they can also occur in relation to non-visual values about landscape. Non-visual values include sounds/noise, associations, memories, knowledge and experiences or other cultural or natural values. As an example, locating four wind farms in a valley previously best known for its historic wineries might change the balance of perception about the valley's associational character, irrespective of whether all four wind farms were sited in a single view shed.

In Scotland the primary argument employed to oppose wind farms is related to the impact on valued landscapes. As in the South African case, the visual impacts are exacerbated by the fact that the locations with the greatest wind resources are often precisely those exposed upland areas which are most valued for their scenic qualities, and which are often ecologically sensitive. The establishment of wind farms together with the associated service roads and infrastructure, transforms landscapes which are perceived to be natural into 'landscapes of power'.

16.3.6 Impact of Wind Farms on Tourism

A review of international literature in the impact of wind farms was undertaken as part of the SIA. Three articles were reviewed, namely:

- Atchison, (April, 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh

- Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government
- Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector

The most comprehensive appears to be a review undertaken by Professor Cara Aitchison from the University of Edinburgh in 2012 which formed part Renewable Energy Inquiry by Scottish Government. The research by Aitchison found that previous research from other areas of the UK has demonstrated that wind farms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction). In addition, to date, there is no evidence to demonstrate that any wind farm development in the UK or overseas has resulted in any adverse impact on tourism. In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development. A study by the Glasgow Caledonian University (2008) found that only a negligible fraction of tourists will change their decision whether to return to Scotland as a whole because they have seen a wind farm during their visit.

The study also found that 51.0% of respondents indicated that they thought wind farms could be tourist attractions. In this regard, the visitor centre at the Whitelee Wind Farm in east Ayrshire Scotland run by ScottishPower Renewables has become one of the most popular 'eco-attractions' in Scotland, receiving 200 000 visitors since it opened in 2009. The potential impact of the proposed Highlands WEFs on the perceptions of visitors, specifically international visitors, has been raised by owners of adjacent game farming operations.

16.3.7 Impact of Wind Farms on Property Values

The literature review undertaken as part of the Social Impact Assessment (SIA) does not constitute a property evaluation study and merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas[16]. The literature reviewed was based on an attempt by the social specialists to identify what appear to be "scientifically" based studies that have been undertaken by reputable institutions. In this regard it is apparent that there are a number of articles available on the internet relating to the impact of wind farms on property values that lack scientific vigour. The literature review also sought to identify research undertaken since 2010. The literature review does not represent an exhaustive review.

In total five articles were identified and reviewed namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159;
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012;
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;

[16] Annexure F contains a more detailed review of the documents

- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

Three of the articles indicate that wind farms have the potential to impact on property values, while two indicate that the impacts are negligible and or non-existent.

In terms of the proposed project the most relevant study is the Urbis study (2016). The authors of the study found that appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values. In this case of the proposed Highlands WEFs the issue of appropriate location has been raised by owners of adjacent game farming operations.

16.4 Assessment of Potential Impacts

Impact Phase: Construction Phase							
Impact description: Creation of employment and business opportunities during the construction phase							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Positive	M	M	H
With Mitigation	H	L	H	Positive	M	H	H
Can the impact be reversed?			Yes, By not implementing the project				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures:

Employment

- Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area;
- Where feasible, efforts should be made to employ 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 BCRLM and BCRLM 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, relevant community representatives and local farmers 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 a training and skills development programmes for local workers 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 SBDM and BCRLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.

- The SBDM and BCRLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

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.

Impact Phase: Construction Phase							
Impact description: Potential impacts on family structures and social networks associated with the presence of construction workers							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, By not implementing the project						
Will impact cause irreplaceable loss or resources?	Unlikely at a community level						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- Where possible the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- The proponent should consider the need for establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the SBDM and BCRLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;
- Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Impact Phase: Construction Phase							
Impact description: Potential impacts on family structures, social networks and community services associated with the influx of job seekers							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	L	Negative	L	L	M
With Mitigation	M	L	L	Negative	L	L	M
Can the impact be reversed?	Yes, By not implementing the project						
Will impact cause irreplaceable loss or resources?	Unlikely at a community level						

Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.

Impact Phase: Construction Phase

Impact description: Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H

Can the impact be reversed?	Yes, repairing damage and compensating for stock losses etc.
Will impact cause irreplaceable loss or resources?	Unlikely at a community level
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WF will be compensated for. The agreement should be signed before the construction phase commences;
- Contractors appointed by the proponent should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;
- The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;
- The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, 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 Environmental Management Programme (EMP) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- The housing of construction workers on the site should be limited to security personnel.

Impact Phase: Construction Phase

Impact description: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H

Can the impact be reversed?	Yes, repairing damage and compensating for losses etc.
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- The proponent should enter into an agreement with the local farmers in the area whereby losses associated with fires that can be proven to be associated with the construction activities for the WF 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;
- No smoking should be permitted on site, except in 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 to provide adequate firefighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- No construction staff, with the exception of security staff, to be accommodated on site over night;
- As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.

Impact Phase: Construction Phase

Impact description: Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H

Can the impact be reversed?	Yes, by rehabilitating disturbed areas.
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods;
- The contractor should inform local farmers and representatives from the SBDM and BCRLM Tourism of dates and times when abnormal loads will be undertaken;
- The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[17], adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
- All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits;
- The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;

[17] Treated effluent (non-potable) water should be used for wetting of roads and construction areas

- The Contractor should be required to collect waste along access roads on a weekly basis;
- Waste generated during the construction phase should be transported to the local permitted landfill site.
- EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times;
- EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.

Impact Phase: Construction Phase

Impact description: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the WEFs and power lines will damage farmlands and result in a loss of farmlands for grazing.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H

Can the impact be reversed?	Yes, by rehabilitating disturbed areas.
Will impact cause irreplaceable loss or resources?	No, however, disturbed areas will need to be rehabilitated
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures:

- The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of the soil and vegetation study. In this regard areas of high potential agricultural and sensitive vegetation soils should be avoided;
- The developer should consult with affected property owners in order to enable them to factor construction activities into their farming schedules;
- The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner in the finalisation process and inputs provided should be implemented in the layout as best as possible;
- The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible;
- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from the soil scientist and discussed with the local farmer;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed;
- The implementation of the Rehabilitation Programme should be monitored by the ECO;
- All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;
- EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;
- Disturbance footprints should be reduced to the minimum.
- Compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.

Impact Phase: Construction Phase

Impact description: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the WEFs and power lines will damage farmlands and result in a loss of farmlands for grazing.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H

With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?			Yes, by rehabilitating disturbed areas.				
Will impact cause irreplaceable loss or resources?			No, however, disturbed areas will need to be rehabilitated				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures:

- The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of the soil and vegetation study. In this regard areas of high potential agricultural and sensitive vegetation soils should be avoided;
- The developer should consult with affected property owners in order to enable them to factor construction activities into their farming schedules;
- The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner in the finalisation process and inputs provided should be implemented in the layout as best as possible;
- The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible;
- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from the soil scientist and discussed with the local farmer;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed;
- The implementation of the Rehabilitation Programme should be monitored by the ECO;
- All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;
- EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;
- Disturbance footprints should be reduced to the minimum.
- Compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.

Impact Phase: Operational Phase							
Impact description: Development of infrastructure to generate clean, renewable energy							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Positive	M	M	H
With Mitigation	M	H	M	Positive	H	H	H
Can the impact be reversed?			Yes, by removing infrastructure.				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures:

- Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members;
- Maximise opportunities for local content, procurement and community shareholding;
- Establish a visitor centre. As indicated in the literature review, visitor centers in Scotland have attracted large numbers of visitors to wind farms.

Impact Phase: Operational Phase							
Impact description: Creation of employment and business opportunities associated with the operational phase							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Positive	M	M	H
With Mitigation	M	M	M	Positive	H	H	H
Can the impact be reversed?			Yes, by removing project.				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures:

- Employment
- Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area;
- Where feasible, efforts should be made to employ 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 BCRLM and BCRLM 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, relevant community representatives and local farmers 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 a training and skills development programmes for local workers 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 SBDM and BCRLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.
- The SBDM and BCRLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

- The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;
- The proponent, in consultation with the SBDM and BCRLM, should investigate the options for the establishment of a Community Development Trust.

Impact Phase: Operational Phase							
Impact description: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**

Without Mitigation	M	H	M	Positive	M	L	H
With Mitigation	M	H	H	Positive	H	H	H
Can the impact be reversed?	Yes, by not implementing the project.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The SBDM and BCRLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the SBDM and BCRLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager; • Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community; • Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.							

Impact Phase: Operational Phase							
Impact description: The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Positive	L	L	H
With Mitigation	M	M	M	Positive	M	H	H
Can the impact be reversed?	Yes, by not implementing agreements.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • Implement agreements with affected landowners.							

Impact Phase: Operational Phase							
Impact description: Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M – H	M	M
With Mitigation	M	M	M	Negative	M – H	M	M
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						

Can impact be avoided, managed or mitigated?	Yes
Mitigation measures: • The recommendations contained in the VIA should be implemented; • Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.	

Impact Phase: Operational Phase							
Impact description: Visual impact (based on comments from stakeholders who did not identify major concerns) associated with the proposed WEF and the potential impact on the areas rural sense of place.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Negative	L	M	M
With Mitigation	M	M	L	Negative	L	M	M
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The recommendations contained in the VIA should be implemented; • Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.							

Impact Phase: Operational Phase							
Impact description: Potential impact on property values and current operations linked to the visual impact associated with the proposed WF and the potential impact on the areas rural sense of place.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The recommendations contained in the VIA should be implemented; • Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact; • The option of compensation for impact on property values and current operations should be considered.							

Impact Phase: Operational Phase							
Impact description: Potential impact of the WF on local tourism							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**

Without Mitigation	M	M	L	Negative	L	L	H
With Mitigation	M	M	L	Negative	L	L	H
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The recommendations contained in the VIA should be implemented; • Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.							

Impact Phase: Operational Phase							
Impact description: Potential impact of the WF on adjacent tourism operations associated with game farming and hunting							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The recommendations contained in the VIA should be implemented; • Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.							

Impact Phase: Decommissioning Phase							
Impact description: Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures:							

- The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned.
- All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning;
- The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

Impact Phase: Operational Phase							
Impact description: Cumulative visual impact associated with the establishment of a WEF on the areas rural sense of place and character of the landscape							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Negative	L	M	M
With Mitigation	M	M	L	Negative	L	M	M
Can the impact be reversed?	Yes, by removing turbines.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The recommendations contained in the VIA should be implemented.							

Impact Phase: Operational Phase							
Impact description: Cumulative impact associated with the establishment of a number of renewable energy facilities that has the potential to place pressure on local services, specifically medical, education and accommodation							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	L	Negative	L	L	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, by implementing effective mitigation.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The Eastern Cape Provincial Government, in consultation with the SBDM and BCRLM and the proponents involved in the development renewable energy projects in the SBDM and BCRLM area should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the area, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the							

construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the SBDM and BCRLM.

Impact Phase: Operational Phase							
Impact description: Cumulative impact associated with the establishment of a number of renewable energy facilities in the region that will create employment, skills development and training opportunities, creation of downstream business opportunities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Positive	M	L	H
With Mitigation	M	H	M	Positive	H	M	H
Can the impact be reversed?	Yes, by not implementing the project.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The proposed establishment of suitably sited renewable energy facilities within the SBDM and BCRLM should be supported.							

16.5 Conclusion

The development of the proposed Highlands South WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.

The Proposed Development Site is also located within a REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities. However, a key concern identified during the SIA relates to the visual impacts associated with the wind turbines and the potential impact on existing, established game farming and hunting operations in the area, specifically the area to the north, east and south of the site. The majority of these operations cater for up-market overseas visitors and the existing "African veld" sense of place represents a key component of their marketing strategy. The establishment of a wind farm on their western boundary would impact on the areas current sense of place, which in turn, may negatively impact on their operations and property values. The potential impacts will be largely be confined to four to five existing game farming operations. The potential localised impact would therefore need to be considered within the context of the location of the Highlands WEFs within the Cookhouse Wind REDZ and the significant socio-economic benefits associated with the establishment of renewable energy facilities.

17 TRAFFIC AND TRANSPORTATION

17.1 Description of the Baseline Environment

The existing sites are farmlands with low trip generation, evidenced by the gravel roads serving the farms and low traffic volumes observed during a site visit in July 2018.

Considering the sites location, Ngqura Port is the preferred port for particularly large equipment and machinery for with the WEF development.

Starting from Ngqura Harbour the route travels north along Neptune Road, east along the R102 (Daniel Pienaar Street).

Some abnormal load vehicles may be able to use the cloverleaf on-ramp to gain access to the N2, but abnormally long vehicles (carrying wind turbine blades) would need to pass through the interchange and turn right at the T-intersection at the end of Daniel Pienaar St and travel south to the end of Daniel Pienaar Street and turn south towards the interchange on the N2 and take the N2 eastbound On-Ramp. The route continues east along the N2 and takes the N10 northbound on-ramp towards Cookhouse. At Cookhouse the route follows the R63 westbound towards and through Somerset East to the site to the west of Somerset East. (See Figure 17.1 below).

Apart from the N2 which is a divided carriageway with two lanes per direction, the N10 and R63 are two-lane undivided roads. The N10 has a number of passing lanes, but its narrow road reserve and tight horizontal curves through Olifantskop Pass requires special attention for particularly long abnormal load vehicles.

The tarred route from Ngqura Port at Koega to the WEF site west of Somerset East is in a good condition. During the site visit it was observed that the above roads have sufficient spare capacity to accommodate the proposed development traffic, as well as expected traffic from other similar (solar) energy projects in the area.

The gravel Minor Roads (MN00412 from R63 to the WEF sites and MN50171 leading from MN00412) are lightly trafficked roads (as observed on-site) and are in reasonable condition. Their vertical alignment, local dips and bumps, would need to be flattened to accommodate particularly low abnormal load vehicles. Judging the condition of the above roads, and SANRAL prioritised projects, it seems unlikely that these roads will be upgraded in the near future.

The gravel roads on the WEF sites are not suited for the WEF and the site will require an extensive new road network to enable access to each wind turbine site.

The construction period is expected to last approximately 18 months to be completed. The construction period will generate the most traffic, both on public roads and on-site.

The trip generation and average trips to site is as follows:

Highlands South WEF 6021 trips to site = 15 trips to site per day over 18 month build period.

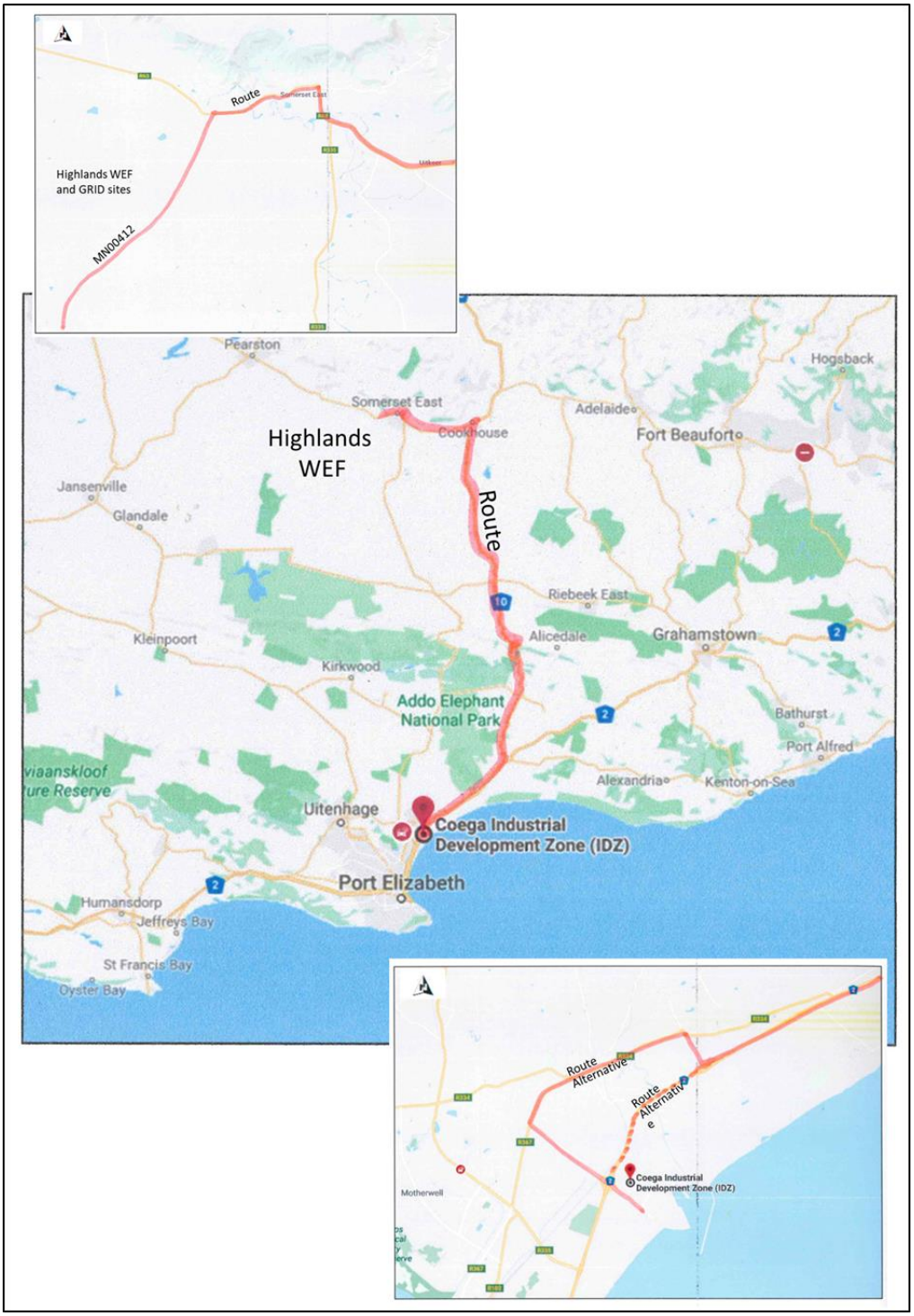


Figure 17.1: Route to site

17.2 Assessment of Potential Impacts

17.2.1 Construction period impacts

Increased traffic flow on route to site, with abnormal load vehicles, some being very large, resulting in slow speeds, impedance to other traffic on local, national, regional and minor roads. This can be mitigated with a Transport Management Plan that should

indicate preferable times for abnormally large vehicles to travel on the road network, when background traffic is lower.

Restrictions on route. These and other related issues would need to be mitigated by a Transport Management Plan that will confirm the best route to site and resolve issues in relation to the machinery and equipment transport to site. The route poses a few restrictions for abnormally long, low vehicles as are noted as below:

- The Neptune Road N2 cloverleaf interchange on-ramps are too tight for abnormally long vehicles, (i.e. transport wind turbine blade). Vehicles not able to negotiate the cloverleaf on-ramp would need to continue to the end of Neptune Road and turn east onto the R367, continue onto the R334 and R102 and take the interchange N2 eastbound on-ramp towards the N10.
- Olifantskop Pass, north of Paterson, has a number of very tight horizontal curves where abnormally long vehicles will track across the opposing lane. It would be necessary to close the pass to the public to allow abnormally long vehicles passage. It is suggested that abnormally long vehicles should travel in convey through the pass to limit its impact. Consideration should also be given to travelling during off-peak periods and on days when traffic flow is lower (i.e. Tuesday to Wednesday).
- The low 4.85 m Rail over Road bridge at Cookhouse is a major height restriction. The road sag curve vertical alignment under the bridge further restricts available height to bridge soffit for long vehicles. An alternate route might be required to bypass this low structure in Cookhouse. This alternate route is shorter distance, carries less traffic, has a Road over Rail structure and is preferred over the route through Cookhouse. The southernmost portion of this route has some very tight bends and accommodating long vehicle turning radii will need to be resolved.
- The R63 makes a 90 degree turn in Somerset East CBD. Vehicle body tracks will need to be applied to this intersection to determine vehicle turning space required. It appears that street furniture would need to be temporarily removed and vehicle parking prohibited to enable long vehicles to make the turn (utilising the full road reserve width). Traffic law-enforcement would need to be on duty to enforce one-way travel through this intersection.
- The gravel surfaced Minor Roads (MR00412 from R63 to the sites and MR50171 leading from MR00412) are in reasonable condition, but their vertical alignment, local dips and bumps, could need flattening to accommodate particularly low abnormal load vehicles.

Degradation of gravel minor road pavement that has potential for vehicle damage or crashes. This can be mitigated by regular maintenance of the minor roads.

Dust on Minor Roads: This has potential to cause accidents due to reduced visibility for motorists. This can be mitigated by reduced travel speed for construction vehicles on the Minor Roads.

Potential crashes at R63/M00142 intersection with motorists not expecting construction vehicles using intersection, over an extended period of time. This can be mitigated by ensuring construction vehicles are roadworthy, construction vehicle drivers are licensed, and by installation temporary roadworks "crossing vehicles" warning signage on the R63 approaches to Minor Road MN00412.

Inadequate road network on-site: The site will require an extensive road network to enable vehicles to reach the laydown areas, substation sites and sites for each wind turbine. This can be mitigated by a Transport Management Plan with roads on-site designed according to vehicle requirements. To save costs, the on-site roads providing access to the Turbine locations will be narrow. This poses potential conflict for two-way traffic movement by large vehicles. It is likely that a one-way route will be considered to overcome this potential issue.

Accident risk in work-zones: There is increased potential for workers being injured by vehicles on-site where the construction activities overlap. This can be mitigated by proper planning to limit overlapping of work zone construction activities.

Impact Phase: Construction Phase							
Impact description: Traffic congestion, impedance to traffic flow due to increase in traffic volumes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	M	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, manage and mitigate traffic						
Mitigation measures: Obtain and adhere to a Transport Management Plan to: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site.							

Impact Phase: Construction Phase							
Impact description: Constraints for large vehicles en-route to site could result in unacceptable traffic impact (safety and congestion). Abnormally long, low or high vehicles will experience constraints along the chosen route, i.e. inadequate space to accommodate turning movements at some intersection and interchange ramps, N10 Olifantskop Pass horizontal alignment inadequate for very long vehicles (transporting turbine blades), low rail over road bridge at Cookhouse with road in a vertical dip, restricted turning space on R63 in Somerset East, low speed road design on minor roads could be problematic for very low vehicles, no suitable roads on-site to access Wind Turbine locations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	H	Negative	M	H	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Obtain and adhere to a Transport Management Plan to: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site; • Design on-site roads to facilitate access to laydown areas, substations and wind turbines; • Conduct a dry-run priori to implementation of the Transport Management Plan.							

Impact Phase: Construction Phase							
Impact description: Deterioration of gravel Minor Roads. Additional heavy traffic on Minor roads could degrade the existing road pavement.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	M	M	M

With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Carry out regular maintenance of the road to ensure that its condition is maintained or improved: • Document condition of gravel roads prior to construction. • Upgrade gravel roads to suitable condition for proposed construction vehicles. • Ensure that the minor road is left in a better condition post-construction.							

Impact Phase: Construction Phase							
Impact description: Additional traffic on gravel Minor Roads will result in more dust that reduces visibility and increases potential for crashes on the Minor Roads.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	L	H	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Reduce travel speed on gravel road to reduce dust: • Post speed restriction signage for construction vehicles on minor roads.							

Impact Phase: Construction Phase							
Impact description: Additional traffic at the Minor Road M00412 intersection with the R63 increases chances of vehicle crashes							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Alert motorists to construction traffic at the access: • Place warning construction vehicle signage on the R63 on each approach to Minor Road M00412. • Ensure that all construction vehicles are roadworthy							

• Ensure that all construction vehicles have appropriate drivers license.

17.2.2 Operational Period Impacts

The WEF will be operational all hours, except during maintenance, breakdowns or interruption of the connection to the Eskom grid. Regular maintenance will be minimal with very few vehicles. A small staff component is anticipated during the operation phase of the project, with possibly technicians/maintenance and security personnel on site as required.

Maintenance vehicle traffic flow on route to site, could possibly include abnormal load vehicles, resulting in slow speeds, impedance to other traffic on local, national, regional and minor roads.

This can be mitigated in a Transport Management Plan that should indicate preferable times for abnormally large vehicles to travel on the road network when background traffic is lower and requisite procedures for safe passage.

In general, operations (including maintenance) will have very low traffic flow and should have a negligible impact.

Impact Phase: Operational Phase							
Impact description: Constraints for large maintenance related vehicles en-route to site could result in unacceptable traffic impact (safety and congestion). Abnormally long, low or high vehicles will experience constraints along the chosen route, i.e. inadequate space to accommodate turning movements at some intersection and interchange ramps, Olifantskop pass horizontal alignment inadequate for very long vehicles (transporting turbine blades), restricted turning space on R63 in Somerset East, low rail over road bridge at Cookhouse with road in a vertical dip, low speed road design on minor roads could be problematic for very low vehicles.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	H	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes, impacts can be managed and mitigated				
Mitigation measures: Refer to Transport Management Plan to: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site.							

17.2.3 Decommissioning Period Impacts

The WEF is expected to be operational for 20 years with possibility of extending to a further 20 years. Trip generation at the decommissioning stage is likely to be outside commuter peak hours. Decommissioning will entail less traffic than the construction phase, and components would be transported to the local dump if not recyclable, or sold to local scrap merchants or other if items have salvage value. Decommissioning should be in accordance with the agreement reached with the affected land owners. Daily trips for the decommissioning period is expected to be low and will typically comprise dump trucks or

low-bed vehicles, with components cut to size on site. Minor road condition and dust is a potential issue requiring mitigation to prevent crashes and possible injury.

Impact Phase: Decommissioning Phase							
Impact description: Deterioration of gravel Minor Roads. Additional heavy traffic on Minor roads could degrade the existing road pavement.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Carry out regular maintenance of the road to ensure that its condition is maintained or improved: • Document condition of gravel roads prior to construction. • Upgrade gravel roads to suitable condition for proposed construction vehicles. • Ensure that the minor road is left in a better condition post-construction.							

Impact Phase: Decommissioning Phase							
Impact description: Additional traffic on gravel Minor Roads will result in more dust that reduces visibility and increases potential for crashes on the Minor Roads.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated						
Mitigation measures: Reduce travel speed on gravel road to reduce dust: • Post speed restriction signage for construction vehicles on minor roads.							

17.3 Conclusion

It can be concluded that the Proposed Development will not have undue detrimental impact on traffic and that identified impacts can be suitable mitigated. It is the reasoned opinion of the specialist that the development of the Highlands WEFs and grids can be approved, from a traffic and transport engineering perspective, subject to the specific requirements and mitigation measures specified.

18 CUMULATIVE IMPACTS

Two developments are located within 35 km of the Highlands WEFs: the Middleton Wind Energy Project and the Pearson Solar PV project (Figure 1.1).

18.1 Geology, Soils and Agriculture

These developments have very similar impacts within a similar agricultural environment, within the same Renewable Energy Development Zone (REDZ), although the solar development occupies a greater footprint of grazing land than the wind facilities. The potential cumulative impact of importance is a regional loss of agricultural land use. What is important in assessing this impact is that the cumulative impact is affecting an agricultural environment that has been declared a REDZ precisely because it is an environment that can accommodate numerous renewable energy developments without exceeding acceptable levels of agricultural land use loss. This is primarily because of the low agricultural capability of land across the REDZ, and the fact that such land is not a scarce resource in South Africa. It is far more preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development, elsewhere in the country.

Another important factor which renders the cumulative impact very low, is the fact that the footprint of disturbance of wind farms is very small in relation to available land (approximately 2% of surface area). Therefore even if every single farm portion across the entire REDZ contained wind farms, the total cumulative footprint would never exceed 2% of the land surface, which would still be below acceptable levels of change. In reality the cumulative impact across the landscape is much lower because only a small percentage of farms are ever likely to contain wind farms.

Impact Phase: Cumulative Phase							
Impact description: Regional loss of agricultural land use Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?	Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.						
Will impact cause irreplaceable loss or resources?	No, because only a very small amount of grazing land is lost and such land is not a scarce resource.						
Can impact be avoided, managed or mitigated?	Yes, to some extent.						
Mitigation measures: • The avoidance of high sensitivity areas by the design layout, and this has already been implemented during the design phase.							

18.2 Freshwater and Wetlands

From an aquatic environment standpoint, the projects in the region don't share any of the same direct subquaternary catchment and thus too far removed. They would also not share any of the new roads, as it has been shown in the past that the access roads have always

had some form of impact on aquatic systems, while internal structures (hard stands and turbines) to a lesser degree.

Presently, no significant cumulative impacts with regard to the proposed turbine placement, hardstands and associated underground cabling were identified as these are located outside of the delineated aquatic systems and their buffers for the proposed site.

Impact Phase: Cumulative Phase							
Impact description: Overall cumulative impact during the construction and operational phases In the assessment of this project, the surrounding projects within a 35km radius of the site were assessed, including a number of Solar projects The author has also reviewed the outcomes of the remaining projects as part of this EIA or other EIA / WUL applications in the region. All of the projects have indicated that aquatic impact avoidance as part of their layouts design process coupled mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts and improving the drainage or hydrological conditions within these rivers so that the cumulative impact would be negligible. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation is implemented by the other projects, noting only a small number of projects ever reach the construction phase and that flows within these systems are sporadic.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures: • Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region • Install properly sized culverts with erosion protection measures at the present road / track crossingsAppropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.							

18.3 Flora and Terrestrial Fauna

According to a map of DEA-registered projects as at July 2018, there are no other renewable energy applications in the immediate vicinity of the site, with the nearest facilities being the Golden Valley, Amakhala Emoyeni and Middleton Wind Energy projects near to Cookhouse. Apart from these wind energy projects, there are also some solar energy developments around Pearston west of the project site. The solar projects are however on the plains and do not affect the same environment as the Highlands project. Given the distance and extent of these different developments, it is clear that the current level of cumulative impact around the Highlands site is relatively low. From a terrestrial ecology point of view, there are also few linkages between the different facilities and as such the potential disruption of ecological processes is unlikely. The major broad-scale ecological corridors that are likely to be operating in the area include an east-west corridor along the great escarpment to the north of the site as well as a north-south and east-west corridor associated with the bands of thicket vegetation that occur on the western slopes of the site going through to Jansenville in west and south towards Kirkwood. As the development footprint in these areas remains very low, it is highly unlikely that these would be impacted to a significant degree by renewable energy development. Given the location

and extent of current developments in the area, the Highlands WEF would generate habitat loss equivalent to approximately 200 ha and while this would contribute to habitat loss at the local scale, broader implications for cumulative impacts would remain low.

Impact Phase: Cumulative Phase							
Impact description: Contribution of the proposed development to cumulative impacts on habitat loss and future ability to meet conservation targets.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	M	H	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			The impact would persist for as long the various developments were present.				
Will impact cause irreplaceable loss or resources?			Potentially if projects do not implement appropriate mitigation and avoidance.				
Can impact be avoided, managed or mitigated?			To some extent, but some of the impact would result from the presence of the facilities themselves which cannot be avoided.				
Mitigation measures: • Minimise the development footprint, especially within the high sensitivity areas as far as possible. • There should be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.							
Residual impact			Some of the impact results from the presence of the facility and would therefore persist for as long as it was operational.				

18.4 Avifauna

The cumulative effect of Proposed Highlands Development along with the actual and predicted impacts of the operational and proposed facilities surrounding highlands, has the potential to affect various bird species at a higher significance than the impacts of the Proposed Highlands Development alone. Key species that may possibly be impacted upon cumulatively include Cape Vulture, Blue Crane, Ludwig's Bustard, Martial Eagle, Amur Falcon, Lesser Kestrel, Rock Kestrel Jackal Buzzard and potentially Verreaux's' Eagle and Black Harrier. Of these, Cape Vulture is of primary concern, as it has suffered collision mortality in the Bedford/Cookhouse area. Even though collisions of Cape Vulture, are not highly likely at Highlands (due to the low abundance and activity of the species on the site), they are possible and even a few mortalities may result in a cumulative impact of high significance.

The cumulative habitat destruction impact for the proposed Highlands development is concluded to be of moderate significance.

If all operational facilities implement appropriate and effective mitigation as outlined by their respective specialists, and if all mitigation measures outlined in this report are implemented for the proposed Highlands developments, the cumulative impact after mitigation is likely to have a moderate significance.

Impact Phase: Cumulative Phase							
Impact description: Cumulative impact of all impacts on avifauna							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	M	H	Negative	H	M	M
With Mitigation	H	M	M	Negative	M	L	M

Can the impact be reversed?	Partially
Will impact cause irreplaceable loss or resources?	Possibly
Can impact be avoided, managed or mitigated?	Partially
Mitigation measures: • All mitigation measures listed in Section 11 of this report and recommended for other projects (Avifaunal Specialist Report, Volume II) must be adhered to.	

18.5 Bats

The cumulative impact on bats was considered by searching for current and potential future development of wind energy facilities within a 35 km and 250 km radius of the project. One project is within the 35 km radius and approximately 67 project applications (nine operational, 14 in process and 44 approved) are within the 250 km radius. It is not likely that all of these facilities will reach commercial operation. This scale was chosen because it represents the average distance between known Natal long-fingered bat roosts within the geographic region the north-eastern subpopulation of this species is located. The proposed Highlands wind energy facilities are located within this region and it is possible that these bats migrate seasonally between such roosts. (Miller-Butterworth et al. 2003). It is important to consider cumulative impacts across the entire scale potentially affected animals are likely to move, especially mobile animals like bats. Impacts at a local scale could have negative consequences at larger scales if the movement between distant populations is impacted (Lehnert et al. 2014; Voigt et al. 2012). For example, Lehnert et al. (2014) demonstrated that among Noctule bats collected beneath wind turbines in eastern Germany, 28 % originated from distant populations in the Northern and North-eastern parts of Europe.

The cumulative impacts could be lower for species that do not migrate over such large distances or resident species that are not known to migrate. Three of the four species recorded during the pre-construction monitoring do not migrate over such large distances. The sphere of the cumulative impact would then likely be restricted to the home ranges and foraging distances of different species, which can range from 1 km to at least 15 km for some insectivorous bats (Jacobs and Barclay 2009; Serra-Cobo and Sanz-Trullen 1998) and up to at least 24 km for some fruit bats (Jacobsen et al. 1986).

Cumulative impacts on bats could increase as new facilities are constructed (Kunz et al. 2007b) but are difficult to accurately predict or assess without baseline data on bat population size and demographics (Arnett et al. 2011; Kunz et al. 2007b) and these data are lacking for many South African bat species. It is possible that cumulative impacts could be mitigated with the appropriate measures applied to wind farm design and operation. Cumulative impacts could result in declines in populations of even those species of bats currently listed as Least Concern, if they happen to be more susceptible to mortality from wind turbines (e.g. high-flying open air foragers such as free-tailed and fruit bats) even if the appropriate mitigation measures are applied. Further research into the populations and behaviour of South African bats, both in areas with and without wind turbines, is needed to better inform future assessments of the cumulative effects of WEFs on bats.

Impact Phase: Cumulative Phase
Impact description: Cumulative Impacts Cumulative indirect impacts to bats, such as those relating to changes to the physical environment (e.g. roost and habitat destruction) are likely to be low across the cumulative impact regions. Cumulative direct impacts to bats, specifically those related to bat mortality, are likely to be higher. For non-migratory species cumulative direct impacts could have a medium or high significance before mitigation but could reduce to medium or low with appropriate turbine siting and operational mitigation if

determined as being necessary based on operational monitoring. Direct impacts on migratory species (i.e. the Natal long-fingered bat) may be high before mitigation but could also reduce to medium with appropriate turbine siting and operational mitigation. However, these ratings would be dependent on all other surrounding wind energy facilities also adopting similar mitigation strategies to reduce impacts to bats.

Limited data are available on the actual impacts to bats at the nine operational facilities in the cumulative impact region. In addition, pre-construction monitoring data of bat activity are not a good predictor of the impacts that may be expected at operational wind farms (Hein et al. 2013), limiting their use in understanding and predicting cumulative impacts. Data from one operational wind farm in the cumulative impact region (approximately 130 km south of the proposed Highlands WEFs) which we were able to access suggested that impacts to bats are high. No current information is available to suggest that operational mitigation strategies are being applied at this specific facility. The addition of wind farms in the cumulative impact region may therefore have negative consequences particularly for the north-eastern subpopulation of the migratory Natal long-fingered bat. However, because of a lack of published data on the impact of wind energy facilities on bats in South Africa, and limited baseline data on bat population size and demographics, the confidence in this assessment is low.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	H	M	H	Negative	H	M	L
With Mitigation	H	M	L	Negative	M	M	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes
Mitigation measures: • As this impact is unlikely to occur, no mitigation options are provided.	
Will this impact contribute to any cumulative impacts?	The cumulative impacts will depend on the number of WEFs in the region, the species involved and the levels of bat mortality. Bats reproduce slowly (Barclay and Harder 2003) and their populations can take long periods of time to recover from disturbances so the cumulative impacts can be high if appropriate management and mitigation is not implemented.

18.6 Noise

The cumulative impact assessment considers the cumulative effects of the proposed development, and other renewable energy projects within 35 km of the proposed Development. Two such other projects have been identified:

- Middleton Wind Energy farm; and
- Pearston Solar Farm.

Each of the above are located more than 20 km from the proposed Development. As such, there is no possibility of cumulative impacts. The cumulative assessment therefore only considers the cumulative effects of the development.

Impact Phase: Construction Phase
Impact description: Construction of Tracks and Hardstanding
2 no. Tracked Excavators
1 no. Articulated Dump Truck
1 no. Bulldozer
1 no. Vibratory Roller
6 no. Haulage Trucks per hour

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, impact is temporary during construction phase.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- Acoustic enclosures/screens should be used to contain noise-generating/equipment;
- Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible;
- Plant and equipment covers and hatches should be properly;
- Silenced equipment should be used where possible;
- Plant should be turned off when not in use;
- Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms;
- The use of vehicle horns should be limited to emergency use only;
- Good public relations should be maintained with local residents that may be affected by noise from site operations.

Impact Phase: Construction Phase

Impact description: Excavation and Concreting of Turbine Foundations

1 no. Tracked Excavator

1 no. Concrete Mixer Truck with pump and boom arm

2 no. Poker Vibrators

1 no. Dump Truck (tipping fill)

1 no. Roller (rolling fill)

1 no. concrete Batching Plant

1 no. Lorry

6 no. Haulage Trucks per hour

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, impact is temporary during construction phase.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:

- Acoustic enclosures/screens should be used to contain noise-generating/equipment;
- Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible;
- Plant and equipment covers and hatches should be properly;
- Silenced equipment should be used where possible;
- Plant should be turned off when not in use;
- Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms;
- The use of vehicle horns should be limited to emergency use only;
- Good public relations should be maintained with local residents that may be affected by noise from site operations.

Impact Phase: Construction Phase							
Impact description: Turbine Erection 1 no. Wheeled Mobile Crane 1 no. Mobile Telescopic Crane 1 no. Diesel Generator 2 no. Torque guns 5 no. Haulage Trucks per hour (Turbine Delivery)							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, impact is temporary during construction phase.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • Acoustic enclosures/screens should be used to contain noise-generating/equipment; • Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible; • Plant and equipment covers and hatches should be properly; • Silenced equipment should be used where possible; • Plant should be turned off when not in use; • Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms; • The use of vehicle horns should be limited to emergency use only; • Good public relations should be maintained with local residents that may be affected by noise from site operations.							

Impact Phase: Construction Phase							
Impact description: Generator (Night-time Use)							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, impact is temporary during construction phase.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • Acoustic enclosures/screens should be used to contain noise-generating/equipment; • Noise-generating plant should be located as far away from the noise sensitive receptors as is feasible; • Plant and equipment covers and hatches should be properly; • Silenced equipment should be used where possible; • Plant should be turned off when not in use; • Where practicable, mobile plant should be fitted with broadband, rather than tonal reversing alarms; • The use of vehicle horns should be limited to emergency use only; • Good public relations should be maintained with local residents that may be affected by noise from site operations.							

Impact Phase: Operational Phase

Impact description: Operation – Day Wind Turbines, Wind Turbine Auxiliary Plant, Transmission Line and Substation							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	Yes, impact would be reversed after decommissioning.						
Will impact cause irreplaceable loss or resources?	No, impact would be reversed after decommissioning.						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • None required							

Impact Phase: Operational Phase							
Impact description: Operation – Night Wind Turbines, Wind Turbine Auxiliary Plant, Transmission Line and Substation							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	H	M	H
With Mitigation	L	H	M	Negative	M	M	H
Can the impact be reversed?	Yes, impact would be reversed after decommissioning.						
Will impact cause irreplaceable loss or resources?	No, impact would be reversed after decommissioning.						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: Use of noise-mitigated turbine: The candidate turbine is available in a noise-mitigated configuration with blade trailing edge serrations and nacelle insulation, which would reduce noise emissions by 2.5 dBA. The following turbines would require to be installed in this configuration: • Cumulatively: turbines 16, 17, 31 and 41 to 48. It should be noted that mitigation of turbines 16 and 17 are only required in respect of location 6 which is not permanently occupied, so subject to agreement with the appropriate landowner, mitigation of turbines 16 and 17 may not be necessary in practice. Mitigation of turbine 31 is required in respect of locations 8 and 9, and mitigation of turbines 41 to 48 in respect of locations 12, 13 and 14. It is understood that agreement may be possible with landowners that noise levels are acceptable and / or relocation of farmworkers at these locations, in which case the use of noise-mitigated turbines may not be necessary. Should a turbine model other than the candidate be installed, consideration should be given to the noise emission of that turbine model and appropriate mitigation included if necessary.							

18.7 Heritage, Archaeology and Palaeontology

In general heritage information from the area is very limited and the cumulative assessment below is thus based partly on the author's specialist knowledge of the landscape and the likely distribution of heritage resources within it. Only four other projects from within a

35 km radius are known. These are the proposed Middleton Wind Energy Project and three proposed Solar PV projects near Pearston.

It is concluded that the cumulative impact significance of the proposed South WEF is low. It can be argued that, following effective mitigation, our scientific understanding of the palaeontology of this region of the Eastern Cape could be markedly improved – a positive cumulative impact outcome that would partially offset the inevitable loss of fossils during WEF construction.

Impact Phase: Construction Phase							
Impact description: Impacts on archaeological resources Archaeological resources may be damaged or destroyed during clearing of the ground or excavation of foundations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No, once archaeological artefacts are disturbed/destroyed the site cannot be recreated.						
Will impact cause irreplaceable loss or resources?	Yes, heritage resources are regarded as unique.						
Can impact be avoided, managed or mitigated?	Yes, it is often easy to realign a section of road if needed but, if this is not possible then archaeological mitigation can be easily effected (there are no identified no-go areas within the present footprint).						
Mitigation measures: • Commission an archaeological walk-through survey to identify sites within final footprint • Carry out any archaeological mitigation for sites of cultural significance that cannot be avoided							

Impact Phase: Construction Phase							
Impact description: Impacts on graves Graves may be damaged or destroyed during clearing of the ground or excavation of foundations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	M	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No, once graves are disturbed/destroyed they cannot be recreated.						
Will impact cause irreplaceable loss or resources?	Yes, every grave is unique.						
Can impact be avoided, managed or mitigated?	Yes, it is often easy to realign a section of road if needed but, if this is not possible then exhumation can be effected (avoidance is strongly preferred).						
Mitigation measures: • Commission an archaeological walk-through survey to identify graves within final footprint • Carry out exhumation of graves that cannot be avoided							

Impact Phase: Construction / Operational and Decommissioning Phase
Impact description: Impacts to the cultural landscape The cultural landscape would be altered through the addition of a new 'layer' comprising of large wind turbines and related infrastructure.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	H	H
With Mitigation	M	M	M	Negative	M	H	H
Can the impact be reversed?			Yes, if the facility is decommissioned and the land rehabilitated then the impacts would cease.				
Will impact cause irreplaceable loss or resources?			No, because there are many other areas with very similar cultural landscape character.				
Can impact be avoided, managed or mitigated?			No, it is not possible to avoid the impacts. However, mitigation measures can very slightly reduce the severity of impacts.				
Mitigation measures: • Minimise cut and fill operations • Minimise unnecessary surface disturbance • Ensure effective rehabilitation of the development area after construction and again after decommissioning • Further measures would be as described by the visual assessment practitioner.							

18.8 Visual

The development of the proposed South WEF, when seen together with the existing wind farms and power lines in the vicinity, would result in cumulative visual impacts resulting in further change to the largely rural character to the area.

Besides the proposed Highlands WEFs, there are existing Eskom powerlines parallel with the R63 Route, an approved solar PV farm near Pearston and a proposed Middleton wind farm south of Cookhouse on the N10 National Route, both within 35 kilometres of the Highlands site.

The Environmental Impact Report (EIR) for the Solar PV Farm near Pearston indicated that the visual impact would be moderate both before and after mitigation, (CEN, 2012). No specialist visual assessment was included in the EIR and no negative cumulative impacts were identified. Except for the brief Scoping Report, no further information could be found on the proposed Middleton Wind Energy Facility, including specialist visual studies.

The fact that the proposed Highlands WEFs fall within the gazetted Cookhouse REDZ means that it would form part of a renewable energy node.

Given that the renewable energy projects mentioned above are not within viewing distance of each other and that they form part of REDZ, the cumulative visual impact significance is considered to be **low** in the local context.

18.9 Social

Impact Phase: Operational Phase							
Impact description: Cumulative visual impact associated with the establishment of a WEF on the areas rural sense of place and character of the landscape							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Negative	L	M	M
With Mitigation	M	M	L	Negative	L	M	M
Can the impact be reversed?			Yes, by removing turbines.				
Will impact cause irreplaceable loss or resources?			No				

Can impact be avoided, managed or mitigated?	Yes
Mitigation measures: • The recommendations contained in the VIA should be implemented.	

Impact Phase: Operational Phase							
Impact description: Cumulative impact associated with the establishment of a number of renewable energy facilities that has the potential to place pressure on local services, specifically medical, education and accommodation							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	L	Negative	L	L	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, by implementing effective mitigation.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The Eastern Cape Provincial Government, in consultation with the SBDM and BCRLM and the proponents involved in the development renewable energy projects in the SBDM and BCRLM area should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the area, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the SBDM and BCRLM.							

Impact Phase: Operational Phase							
Impact description: Cumulative impact associated with the establishment of a number of renewable energy facilities in the region that will create employment, skills development and training opportunities, creation of downstream business opportunities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Positive	M	L	H
With Mitigation	M	H	M	Positive	H	M	H
Can the impact be reversed?	Yes, by not implementing the project.						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures: • The proposed establishment of suitably sited renewable energy facilities within the SBDM and BCRLM should be supported.							

18.10 Traffic and Transportation

The construction period is expected to last approximately 18 months for each phase, and run consecutively (WEF including GRID substations and connections). The construction period will generate the most traffic, both on public roads and on-site.

The trip generation and average trips to site, for each Phase, is as follows:

WEF Build:

North WEF – 5687 trips to site = 14 trips to site per day over 18 month build period.

Central WEF - 4683 trips to site = 12 trips to site per day over 18 month build period.

South WEF - 6021 trips to site = 25 trips to site per day over 18 month build period.

Assuming a worst case scenario, that the project incorporates all six components, the total number of trips to site is 16391, at an average of 41 trips to site per day.

There is one wind and several solar projects approved in the Pearston Area. It could be assumed that these projects will be completed before the Highlands WEF is approved and constructed, judging by the approvals process timelines.

The 140 MW power project in Middleton (approximately 35 km from Highlands WEF) is still in process and possibly that construction could coincide with the Highlands WEF and GRID project construction.

It is estimated that the Middleton (wind energy) project would generate on average around 41 trips to site per day assuming the project is built in just under a year. It is estimated that this would include 3 to 4 abnormal vehicle trips (from Ngqura Port) to site per day for 87 days. Apart from a few ISO truck container deliveries, other vehicle trips are more local in nature.

The 5 solar plants in Pearston area, totalling 230 MW, is expected to generate some 10 heavy vehicle trips to site per day (from Port Elizabeth or Koega) and some 6 buses and some 80 light vehicle trips (mostly staff and workers arriving in the AM and departing in the PM, from nearby towns such as Pearston and Somerset East).

As a worst case scenario it is assumed that all these developments could coincide with the Highlands WEF abnormal load trips to site, along the N2 and N10.

Impact Phase: Construction Phase							
Impact description: Constraints for large vehicles en-route to site could result in unacceptable traffic impact (safety and congestion). Abnormally long, low or high vehicles will experience constraints along the chosen route, i.e. inadequate space to accommodate turning movements at some intersection and interchange ramps, N10 Olifantskop Pass horizontal alignment inadequate for very long vehicles (transporting turbine blades).							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	H	Negative	M	H	H
With Mitigation	M	L	L	negative	L	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures:
Prepare a Transport Management Plan to:
Where possible co-ordinate safe transport of materials, equipment, etc. to site, most particularly through the N10 Olifantskop Pass;
Co-ordinate traffic law-enforcement and transport to site.

19 SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

This BAR has provided a description of the proposed Highlands Southy Wind Energy Facility and its associated infrastructure. It has also discussed the need and desirability of the proposed project. The environmental legislation and planning contexts for the proposed WEF has been documented, including the proposed site's baseline environment. Specialist investigations and detailed assessments have been conducted for the following areas of study:

- Geology, soils and agriculture;
- Freshwater and wetlands;
- Flora and terrestrial fauna;
- Avifauna;
- Bats;
- Noise;
- Cultural Heritage, Archaeology and Palaeontology;
- Visual.
- Social; and
- Traffic and Transport;

The above studies assessed the potential impacts of the proposed development. A summary of the potential impacts is presented in the tables below.

The impacts on the site need to be viewed in the context of the country's energy mix and the negative externalities associated with current dominant energy sources such as coal, often in areas of high potential soils – such as the Eastern Highveld and the pollution that they produce. With this comparison in mind the impact of a wind energy facility is negligible compared to the damaging impacts of coal mining. Indeed wind energy is associated with positive externalities in the form of Economic Development benefits and the cheap tariff at which it is bought. Therefore, in perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role and in the role that externalities associated with power production.

No environmental fatal flaws were identified during the assessment. Mitigation measures to avoid impacts are primarily associated with measures to be utilised during the construction phase to prevent negative impacts from occurring. Where impacts cannot be avoided, appropriate environmental management measures must be implemented to mitigate impact. Environmental specifications for the management of potential impacts are detailed within the EMPr (Appendix B).

19.1 Summary of Construction Phase Impacts

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Loss of Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Wetlands and freshwater							
Riparian systems & watercourses	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increase in sedimentation & erosion	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized water quality	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
On Vegetation	L	H	M	Negative	M	H	H
With Mitigation	*L*	*M*	*M*	*Negative*	***M***	*H*	*H*
On Fauna	L	L	H	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***L***	*L*	*M*
Avifauna							
Habitat destruction	L	M	M	Negative	M	H	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Disturbance and Displacement	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Bats							
Roost disturbance	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Roost destruction	L	H	L	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Habitat modification	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Noise							
Construction of Tracks and Hardstanding	L	L	H	Negative	M	M	H

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Excavation and Concreting of Foundations	L	L	H	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Turbine Erection	L	L	H	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Generator (Night-time Use)	L	L	M	Negative	L	L	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Heritage and Archaeology							
On Archaeological Resources	L	H	L	Negative	M	M	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
On graves	L	H	H	Negative	M	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
On cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*H*	*H*
Palaeontology							
On palaeontological resources	L	H	L	Negative	M	M	M
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*M*
Visual							
Visual effect on sense of place	L	L	M	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***M***	*M*	*M*
Social							
Employment and business creation opportunities	M	L	M	Positive	M	M	H
With Mitigation	*H*	*L*	*H*	*Positive*	***M***	*H*	*H*
Construction workers on local communities	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Impact of job seekers on local communities	M	L	L	Negative	L	L	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*M*

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Risk to safety, livestock & farms	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increased fire risk	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
By construction vehicles	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
On farmland	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	*L*	*L*	*H*
Traffic							
Traffic Flow	M	L	M	Negative	M	M	M
With Mitigation	*M*	*L*	*M*	*Negative*	***L***	*L*	*M*
Route Constraints	M	L	H	Negative	M	H	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Minor Road Degradation	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Minor Road Dust	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Intersection Road Safety	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*

19.2 Summary of Operational Phase Impacts

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Agricultural land	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Additional land use income	L	M	L	Positive	M	H	H
With Mitigation	*L*	*M*	*L*	*Positive*	***M***	*H*	*H*
Wetlands and freshwater							

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Impact on riparian systems	L	L	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Sedimentation and erosion	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized surface water quality	L	M	L	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
Faunal impacts	L	M	M	Negative	M	H	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil erosion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Alien plant invasion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
CBAs & Ecological Processes	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Avifauna							
Collisions with wind turbines	M	M	H	Negative	M	H	M
With Mitigation	*M*	*M*	*H*	*Negative*	***M***	*M*	*M*
Collisions with overhead powerlines	L	M	H	Negative	M	M	M
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*M*
Electrocution	L	M	M	Negative	M	M	M
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*H*
Disturbance and displacement	M	M	M	Negative	M	M	L
With Mitigation	*L*	*M*	*M*	*Negative*	***L***	*L*	*L*
Disruption of Local Bird Movements	M	M	M	Negative	L	L	L
With Mitigation	*M*	*M*	*M*	*Negative*	***L***	*L*	*L*
Bats							
Bat mortality during commuting / foraging	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*L*	*M*

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Bat mortality during migration	H	M	M	Negative	M	L	M
With Mitigation	*M*	*M*	*M*	*Negative*	***L***	*L*	*M*
Habitat creation in high risk locations	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Light pollution	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Noise							
Noise (Day)	L	H	L	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Noise (Night)	L	H	H	Negative	H	M	H
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*M*	*H*
Heritage and Archaeology							
Cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	*M*	*H*	*H*
Visual							
Intrusion on rural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*H*
Social							
Clean, renewable energy	M	M	M	Positive	M	M	H
With Mitigation	*M*	*H*	*M*	*Positive*	***H***	*H*	*H*
Employment and business opportunities	M	M	L	Positive	M	M	H
With Mitigation	*M*	*M*	*M*	*Positive*	***H***	*H*	*H*
Community Trust	M	H	M	Positive	M	L	H
With Mitigation	*M*	*H*	*H*	*Positive*	***H***	*H*	*H*
Income for affected farmers	M	M	L	Positive	L	L	H
With Mitigation	*M*	*M*	*M*	*Positive*	***M***	*H*	*H*
Sense of place (landscape)	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Sense of place (stakeholders)	M	M	L	Negative	L	M	M
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*M*	*M*

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Property values	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Tourism in the region	M	M	L	Negative	L	L	H
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*L*	*H*
Adjacent tourism operations	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Traffic							
Route Constraints	M	L	H	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*

19.3 Summary of Decommissioning Phase Impacts

Decomm. Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Agricultural land loss	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
Faunal impacts	M	L	H	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***L***	*L*	*H*
Soil erosion	M	H	M	Negative	H	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Alien plant invasion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Birds							
Disturbance and Displacement	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Heritage and Archaeology							
Impacts to the cultural landscape	M	M	M	Negative	M	H	H
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*H*	*H*
Visual							

Decomm. Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Potential visual intrusion	M	M	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Neutral*	***L***	*M*	*M*
Social							
Loss of jobs and income	M	M	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Traffic							
Minor Road Degradation	L	L	M	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Minor Road Dust	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*

19.4 Summary of Cumulative Impacts

The proposed Highlands WEFs, were assessed cumulatively, with respective to other renewable energy developments within a minimum of 35 km radius to a maximum of 500 km. Cumulatively the proposed WEFs have been assessed to have a low impact significance with the implementation of appropriate and effective mitigation measures (as prescribed in this BAR), with regards to visual, traffic and transportation, terrestrial ecology, aquatics, heritage, archaeology and palaeontology and agricultural potential. Birds assessed that the proposed Highlands WEFs may have a medium cumulative impact on avifauna in the region, while bats assessed the WEF to potentially have a medium impact on bat population taking into consideration of renewable energy developments within a 500 km radius of the development site (due to the migratory nature of bats).

In terms of noise impacts, other renewable energy facility developments are located more than 20 km from the Proposed Development. As such, there is no possibility of cumulative impacts. The cumulative noise assessment therefore only considers the cumulative effects of the Highlands WEFs development. The operation of the Highlands WEFs at night has the potential to have a medium impact to the residential occupants within less than 2 km from turbines. Land owners have confirmed that there are no permanent residents or occupiers in any of the houses on site. Some farm workers live there temporarily. Mitigations proposed with respect to the potential cumulative impact have reduced impacts from high to medium with the use of noise mitigated turbines in certain locations, or with agreements with landowners that there are no permanent residents or occupiers within 2 km of operating turbines.

During the construction phase potential impacts to the cultural landscape was assessed to be of a medium significance. Employment opportunities, skills development and potential business opportunities with the construction and operation of the WEF was assessed to be of a high positive significance.

20 IMPACT STATEMENT

The proposed Highlands South Wind Energy Facility and its associated infrastructure has, as part of the proposed Highlands Wind Energy Facilities and associated infrastructure, including grid connection infrastructure is located within the Cookhouse REDZ, and has the potential to provide much needed renewable energy to the country's grid. The use of

renewable energy to provide power to South Africa is supported at International, National, Provincial and Local Government Levels. Further, given South Africa's need for additional electricity generation and the need to decrease the country's dependency on coal-based power, renewable energy has been identified as a national priority, with wind energy identified as one of the most readily available, technically viable and commercially cost-effective sources of renewable energy.

The potential positive impacts associated with the proposed project is further recognised through the creation of jobs for the local community, and the positive contributions to the socio-economic development of the surrounding areas and local communities.

Should the Highlands South WEF be developed, the actual physical footprint of the wind turbines and associated on-site infrastructure will occupy an area of land equivalent to less than 1% of the total Proposed Development Site. Small livestock grazing and other agricultural activities can continue in parallel with the operation of the turbines. The project will have no significant impact in terms of loss of agricultural productivity. The Final Mitigated Layout avoids all sensitive areas identified by the specialists' investigations (Figure 20.1). Should the additional mitigation measures identified by specialists and the recommendations of the EMPr be effectively implemented the negative impacts associated with the proposed project will be significantly reduced. The study has concluded that there are no negative high residual impacts, including potential cumulative impacts associated with the proposed development.

Taking into consideration the findings of the BA process for the proposed project and the fact that recommended mitigation measures have been used to inform the project layout design, it is the opinion of the Environmental Assessment Practitioner (EAP) that the majority of negative impacts associated with the implementation of the proposed project have been mitigated to acceptable levels. While the residual impacts of the project will have an impact on the local environment, and potentially on four to five existing game and hunting tourism operations, the extent of the benefits associated with the implementation of the projects will benefit a much larger group of people, in terms of renewable energy supply and positive local and regional economic impact. In addition, the area has been designated a Renewable Energy Development Zone for wind energy in particular, through a Strategic Environmental Impact Assessment by National Government.

Overall, it is recommended that the Highlands South WEF be approved, subject to the implementation of all recommended mitigation measures and management actions contained in all the specialist reports.

20.1 Conditions to be included in the EA

All recommendations and proposed mitigation measures detailed in the specialists report (Volume II) and EMPr (Appendix B) must be implemented and adhered to.

20.1.1 Ecology

A specialist must be appointed to conduct a walkthrough of the final development footprint prior to the commencement of construction.

20.1.2 Freshwater and Wetlands

Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off.

All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or

2820000 2830000

-3860000 -3860000

-3870000 -3870000

2820000 2830000

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

ARCUS

- South WEF Turbine (Final Mitigated Layout)
- Proposed Roads
- Hardstands & Laydown Areas
- South WEF Internal Cabling
- Substation B, O&M Buildings and Laydown Areas
- High Ecological Sensitivity
- Palaeontology Buffer
- Highlands Watercourse crossings 32m buffer
- High Heritage Sensitivity
- High Bat Sensitivity (No turbines, other infrastructure is permitted)
- Visual No-Go area
- Visual High Sensitivity

Avifaunal Sensitivity

- No Go Nest Buffer
- High Sensitivity (No Turbines, but other infrastructure is permitted)
- WULA Watercrossings

1:65,000 Scale @ A3

0 1.5 3km

NORTH

Produced By: AA	Ref: 2780-REP-049
Checked By: SC	Date: 13/09/2018

Environmental Sensitivity
Figure 20.1

Highlands South WEF
Basic Assessment Report

C:\Users\Anja\Desktop\2780 Highlands WEF EIA\Document Files\Reports\2780_Highlands WEF EIA.aprx\South WEF Fig 20.1 Environmental Sensitivity

serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 32 m from any demarcated water courses, unless agreed otherwise with the Environmental Control Officer (ECO).

It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within areas of disturbance (inclusion of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation. The walkdown is required as the final cut/fill and embankments for roads and other structures could not be provided at this point, thus it would be important to evaluate in terms of the aquatic environment and evaluate the need for a Water Use License / GA for these areas.

20.1.3 Avifauna and Bats

Operational phase monitoring of birds and bats must be undertaken according to applicable guidelines current at the start of the operational phase. The monitoring should not be undertaken according to those guidelines that are current at the time of the environmental authorisation. The information collected during the operational monitoring must be shared with Bird Life SA and EWT, as well as the South African Bat Association Panel (or any other agency that comes into effect, which centrally collects information to inform the effects of WEF on birds and bats). Monitoring and carcass searching must be undertaken throughout the life span of the development, at an agreed frequency with specialists.

20.1.4 Noise

Noise due to the operation of the Proposed Development is not to exceed 45 dBA, $L_{eq,16hr}$ at any residential dwelling present at the time of this consent.

It is recommended that, prior to construction of the proposed development, ambient noise levels within the study area are re-measured and analysed in relation to wind speed, following the methodology described in ETSU-R-97 and the advice of the GPG. Such measurements should then be repeated within the first 12 months of operation at selected locations within the 42-45 dBA noise contours as shown to confirm the effectiveness of mitigation measures.

20.1.5 Visual

Ensure that visual management measures are included as part of the EMPr, monitored by an Environmental Control Officer (ECO), including siting of the construction camp and stockpiles, dust suppression and litter control measures, as well as rehabilitation of borrow pits and haul roads, with monthly reporting to an environmental management team.

Ensure that visual mitigation measures are monitored by management on an on-going basis, including the maintenance of rehabilitated areas, control of signage, lighting and wastes on the site, with interim inspections by the ECO.

20.1.6 Heritage, Archaeology and Palaeontology

- Monitoring of all substantial excavations (e.g. wind turbine foundations) for fossil material on an on-going basis during construction phase;
- Application of Chance Fossil Finds Procedure (See Appendix 2 of palaeontological specialist study): safeguarding new fossil finds and reporting to ECPHRA by ECO for possible recording and sampling by professional palaeontologist;
- The access road via Farm 105/rem must not be used;
- The large valley on Farm 105/1 must be avoided; especially the archaeological site between waypoints 1781, 1793 and 1796 (Volume II: Heritage Impact Assessment);

- A minimum 30 m buffer to be maintained around all graves, ruins and buildings (but note possible exception in next recommendation);
- The fence incorporating historical stone fence posts (waypoint 1720 lies on this fence line) should be avoided if possible;
- A final walk-down survey of the authorised footprints should be carried out at least 6 months before the start of construction in order for any archaeological mitigation requirements to be determined and carried out;
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

APPENDIX A: EAP DECLARATION OF INDEPENDENCE & CV

APPENDIX B: ENVIRONMENTAL MANAGEMENT PROGRAMME