ARCUS

DRAFT SCOPING REPORT

COMBINED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 1 & 2 AND ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 & 2 WESTERN CAPE & NORTHERN CAPE

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On behalf of

Emoyeni Wind Farm Project Proprietary Limited

JUNE 2014

Prepared By:

Arcus Consultancy Services

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SCOPING REPORT

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EAP STATEMENT OF INDEPENDENCE

This draft scoping report has been commissioned by Windlab Developments South Africa (Pty) Ltd on behalf of Emoyeni Wind Farm Project Proprietary Limited (EWFP) to undertake a combined environmental impact assessment in terms of the 2010 EIA Regulations R.543, R.544, R.545 and R.546 under the National Environmental Management Act, 1998 (Act No. 107 of 1998, with amendments) ('the Regulations').

In compiling this report, the authors comply with the general requirements for Environmental Assessment Practitioners (EAPs) as set out below in the Regulations:

"*General requirements for EAPs or a person compiling a specialist report or undertaking a specialised process:*

17. An EAP appointed in terms of regulation 16(1) must—

(a) be independent;

(b) have expertise in conducting environmental impact assessments, including knowledge of the

Act, these Regulations and any guidelines that have relevance to the proposed activity;

(c) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

(d) comply with the Act, these Regulations and all other applicable legislation;

(e) take into account, to the extent possible, the matters referred to in Regulation 8 when preparing the application and any report relating to the application; and

(f) disclose to the applicant and the competent authority all material information in the possession of the EAP that reasonably has or may have the potential of influencing—

(i) any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or

(ii) the objectivity of any report, plan or document to be prepared by the EAP in terms of these Regulations for submission to the competent authority."

Jennifer Slack

(EAP-SA Certified)

ABBREVIATIONS AND ACRONYMS

AGIS	Agricultural Geographic Information System
BGIS	Biodiversity Geographic Information System
BEE	Black Economic Empowerment
BID	Background Information Document
BWLM	Beaufort West Local Municipality
CITES	Convention on the Trade in International Endangered Species
CKDM	Central Karoo District Municipality
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibel
DEA	National Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEIAR	Draft Environmental Impact Assessment Report
DEM	Digital Elevation Model
DENC	Department of Environment and Nature Conservation (Northern Cape)
DoE	Department Of Energy
DWA	National Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESA	Ecological Support Area
Eskom	Eskom Holdings SOC Limited
EWFP	Emoyeni Wind Farm Project Proprietary Limited
FEIAR	Final Environmental Impact Assessment Report
FEPA	Freshwater Ecosystem Priority Area
GIS	Geographical Information Systems
GNR	Government Notice Regulation
GWh	Gigawatt hour
HDI	Historically Disadvantages Individuals
HWC	Heritage Western Cape
HV	High Voltage
Hz	Hertz
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for the Conservation of Nature

km	Kilometre
kV	Kilovolt
kWh	Kilowatt Hours
LUPO	Land Use Planning Ordinance (Ordinance 15 of 1985)
m	Metre
mm	Millimetre
MW	Megawatt
NEMA	National Environmental Management Act (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (Act 25 of 1999)
NSD	Noise Sensitive Development
PES	Present Ecological State
PPA	Power Purchasing Agreement
PICC	Presidential Infrastructure Coordinating Committee
PPP	Public Participation Programme
PSEIA	Plan of Study for EIA
QDS	Quarter Degree Squares
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RSH	Rotor Swept Height
SABAAP	South African Bat Assessment Advisory Panel
SABIF	South African Biodiversity Information Facility
SAGC	South African grid code
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SIPS	Strategic Integrated Projects
SPV	Special Project Vehicle
TWI	Total Wetness Index
WDSA	Windlab Developments South Africa (Pty) Ltd
WULA	Water Use License Application

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Chapter 1: Introduction
Chapter 2: The Proposed Development
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1 INTRODUCTION

1.1 Background

Emoyeni Wind Farm Project Proprietary Limited (EWFP) are proposing the Umsinde Emoyeni Wind Energy Facility (WEF), and associated infrastructure including grid connection infrastructure (the Proposed Development), located near the town of Murraysburg in the Western Cape. A small portion of the Proposed Development Site (which comprises the WEF Site and the Grid Site: Figure 1.1) transcends into the Northern Cape Province.

This document is the Draft Scoping Report for the Proposed Development (more information on this is provided in Section 1.2.4).

There are four components to the Proposed Development, representing two development phases:

- Umsinde Emoyeni WEF: Phase 1;
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1;
- Umsinde Emoyeni WEF: Phase 2; and
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2.

The location of the Proposed Development Site is shown on Figure 1.1 and the specific boundaries of the four component boundaries on Figures 1.2 and 1.3 respectively for the WEF and Grid Site Boundaries. It should be noted this site boundary includes the total area within which the Proposed Development may be developed. The footprint of the Proposed Development will only occupy a small portion of the land within this boundary.

Each WEF development phase will comprise up to 98 wind turbines, with each turbine having an installed generation capacity of between 1.5 and 3.5 megawatts (MW). Turbines with a maximum height to blade tip of 180 m will be considered (a hub height up to 120 m, rotor diameter up to 130 m) (Figure 2.1). Both Phase 1 and Phase 2 of the WEF will be located within the WEF Site Boundary (Figure 1.1).

In addition to the Umsinde Emoyeni WEF, EWFP also proposes obtaining Environmental Authorisation from the Department of Environmental Affairs (DEA) for Eskom Transmission and Eskom Distribution Grid Connection Infrastructure for the required grid connection infrastructure. If an Environmental Authorization is granted, this will be entirely or partially transferred from EWFP to Eskom Holdings SOC Limited (Eskom) as applicable in advance of construction. The grid connection infrastructure will be routed from a start location within the WEF Site Boundary to the existing National Grid (Figure 1.1).

Arcus Consultancy Services Ltd (Arcus) have been appointed to undertake the environmental impact assessment (EIA) process, incorporating both the scoping and EIA phase, for the Proposed Development. The scoping and EIA process will be conducted through a combined exercise for all four components of the Proposed Development. Each component is subject to a separate application for Environmental Authorisation to the DEA.

1.2 Environmental Impact Assessment

1.2.1 Legislation and Guidance

The EIA process is prescribed by the Environmental Impact Assessment Regulations (Government Notice R.543 in Government Gazette 33306 of 18 June 2010)[1], which were introduced through Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA)[2]. The regulations also comprise three listing notices (Government Notice R.544, R.545 and R.546).

Other relevant legislation has informed the scope and content of this Draft Scoping Report including:

- Constitution of the Republic of South Africa (Act No. 108, 1996)[3];
- National Environmental Management Act (Act No. 107, 1998)[4];
- Environmental Conservation Act (Act No. 73, 1989)[5];
- National Heritage Resources Act (Act No. 25, 1999)[6];
- National Environmental Management: Biodiversity Act (Act No 10, 2004)[7];
- National Environmental Management: Air Quality Act (Act No. 39, 2004)[8];
- Conservation of Agricultural Resources Act (Act No. 43, 1983)[9];
- National Water Act (Act No. 36, 1998)[10];
- Aviation Act (Act No. 74, 1962)[11];
- National Environmental Management: Waste Act (Act No. 59, 2008)[12];
- National Forest Act (Act No. 84, 1998)[13];
- National Environmental Management: Protected Areas Act (Act No. 57, 2003)[14]; and
- National Roads Act (Act No. 7, 1998)[15]

[1] Environmental Impact Assessment Regulations. Available online: http://www.environment.co.za/environmental-laws-and-legislation-in-south-africa/eia-environmental-impact-assessment-regulations-law-south-africa.html Accessed 17/06/2014.
[2] National Environmental Management Act. Available online: http://www.environment.co.za/environmental-laws-and-legislation-in-south-africa/nema-south-africa-national-environmental-management-act-legislation-and-environmental-acts.html Accessed 17/06/2014.
[3] Constitution of the Republic of South Africa. Available online: http://www.gov.za/documents/constitution/1996/a108-96.pdf. Accessed 17/06/2014
[4] National Environmental Management Act. Available online: http://www.environment.co.za/environmental-laws-and-legislation-in-south-africa/nema-south-africa-national-environmental-management-act-legislation-and-environmental-acts.html Accessed 17/06/2014.
[5] Environment Conservation Act. Available online: http://www.saflii.org/za/legis/consol_act/eca1989302.pdf Accessed 17/06/2014.
[6] National Heritage Resources Act. Available online: http://www.unesco.org/culture/natlaws/media/pdf/southafrica/za_natheritagresources1999_engorof.pdf Accessed 17/06/2014.
[7] National Environmental Management: Biodiversity Act. Available online: http://www.sanbi.org/sites/default/files/documents/documents/biodiversityact2004pdf.pdf Accessed 17/06/2014.
[8] National Environmental Management: Air Quality Act. Available online: http://www.saflii.org/za/legis/consol_act/nemaqa2004454.pdf Accessed 17/06/2014.
[9] Conservation of Agricultural Resources Act. Available online: http://www.sanbi.org/sites/default/files/documents/documents/conservationofagriculturalresourcesact.pdf Accessed 17/06/2014.
[10] National Water Act. Available online: http://www.sanbi.org/sites/default/files/documents/documents/conservationofagriculturalresourcesact.pdf Accessed 17/06/2014.
[11] Aviation Act. Available online: http://www.kzndae.gov.za/Portals/0/Environment/EIA/ACTS/Aviation%20Act.pdf Accessed 17/06/2014.
[12] National Environmental Management: Waste Act. Available online: http://sawic.environment.gov.za/documents/384.pdf Accessed 17/06/2014.
[13] National Forest Act. Available online: http://www.dwaf.gov.za/Documents/Forestry/Tact84.pdf Accessed 17/06/2014.
[14] National Environmental Management: Protected Areas Act. Available online: http://www.saflii.org/za/legis/consol_act/nempaa2003467.pdf Accessed 17/06/2014.
[15] National Road Act. Available online: http://sanral.ensight-cdn.com/content/act7.pdf Accessed 17/06/2014.

- Astronomy Geographic Advantage Act (Act No. 21 of 2007)[16]
- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)[17];
- Performance Standards and Equator Principles (IFC, June 2013)[18];
- Independent Communications Authority of South Africa Act (Act No. 13 of 2000; as amended)[19].

Specific guidance relevant to each specialist area is referred to within Chapters 4 – 12 as appropriate.

1.2.2 Overview of the EIA Process

NEMA promotes the use of scoping and EIA in order to ensure the integrated environmental management of activities.

Section 24(1) of NEMA states:

"In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorisation."

EIA is ultimately a decision-making process with the specific aim of selecting an option that will provide the most benefit, and cause the least impact. The EIA process should identify activities which may have a detrimental effect on the environment, and which would therefore require Environmental Authorisation prior to commencement.

The EIA process commences with formally notifying the DEA of the Proposed Development by the submission of application forms. Following the notification, the EAP, along with the team of technical specialists, will commence the scoping phase, in order to inform decisions of the appropriate "scope" of the EIA process. This involves establishing the existing environmental baseline of the site proposed for development, considering the type of development and its potential impacts on the existing environment, and therefore determining what potential impacts should be assessed and how, within the EIA process. The EAP therefore compiles a Draft Scoping Report (this document) which will then be made available for public and stakeholder comment for a prescribed consultation period of 40 days. All comments received in response to the Draft Scoping Report will be incorporated into a Final Scoping Report and Plan of Study for EIA (PSEIA). Interested and Affected Parties (I&APs) are then able to comment on the Final Scoping Report and PSEIA by submitting their comments directly to the DEA, notification regarding the availability of the Final Scoping Report and PSEIA as well as the contact details for submission to the DEA will be distributed to registered I&APs.

The Final Scoping Report is then submitted to the DEA, as the competent authority, for approval. This marks the formal end of the scoping phase, after which the EAP undertakes the EIA and compiles the Draft EIA Report (DEIAR) which will then, like the Draft Scoping Report, be made available for public and stakeholder comment for a period of 40 days. Any comments will then be considered and incorporated as applicable into a

[16] Astronomy Geographic Advantage Act. Available online: http://www.polity.org.za/article/astronomy-geographic-advantage-act-no-21-of-2007-2008-07-17 (Accessed 19th June 2014)
[17] Mineral and Petroleum Resources Development Act. Available online: file:///C:/Users/jennifers.ARCUS/Downloads/mineraland_petroleum_resources_development_actmprda.pdf (Accessed 19th June 2014)
[18] The Equator Principles III. Available online http://www.equator-principles.com/index.php/ep3 (Accessed 19th June 2014)
[19] Independent Communications Authority of South Africa Act. Available online: https://www.icasa.org.za/Portals/0/Independent%20Communications%20Authority%20of%20South%20Africa%20Act,%202000.pdf (Accessed 19th June 2014)

Final EIA Report (FEIAR). I&APs are then notified of the availability of the FEIAR and advised that should they like to comment on the report, they must submit their comments directly to the DEA (contact details of the DEA will be included in the notification documents).

Once a FEIAR has been submitted, the competent authority (the DEA) will make a decision on whether or not to grant or refuse Environmental Authorisation.

1.2.3 Listed Activities in the EIA Regulations

All listed activities which potentially form part of the Proposed Development, and which require environmental authorisation, are included in the application for Environmental Authorisation prepared and submitted to the DEA. The listed activities for the Proposed Development are split into the WEFs and the grid connection infrastructure. Separate applications have been made for each component. The activities are indicated in Tables 1.1 and 1.2 below.

Any Environmental Authorisation which is obtained from the DEA can cover only those specific listed activities for which applications were made. To ensure that all listed activities that could potentially be required are covered by the Environmental Authorisations, a precautionary approach was followed when identifying listed activities in the application for Environmental Authorisation form, i.e., if an activity could potentially form part of the Proposed Developments, it is listed. Any changes to this list will be notified in writing to the DEA, and I&APs will also be informed accordingly.

Table 1.1: Listed activities that form part of the Umsinde Emoyeni WEF Applications (Phase 1 and 2)

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
GN.R544, 18 June 2010 (Listing Notice 1: Basic Assessment)	10 (i)	The construction 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 kV.	33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV onsite substation. The powerlines will be installed underground where possible.
	11 (iii), (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m² in size; or (xi) infrastructure or structures covering 50 m² or more where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Bridges maybe required to cross watercourses for the access tracks. The location and extent of these water crossings will be determined through the EIA process. The footprint of the buildings is not yet known and will be confirmed through the EIA phase. The footprint of the turbines and associated infrastructure may exceed 50 m² in total. The exact position of the WEF and all associated infrastructure and activities will only be identified at the conclusion of, and informed by, the EIA process. Considering the extent of the project study area and the fact that the study area includes watercourses it is anticipated that this listed activity will be triggered.
	13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 m³.	Storage of fuel on site, for use during the construction phase, will be required. The volume stored will be less than 500 m^3. The proposed on-site substation is likely to require the use of transformer oils and other hazardous substances, during the operational phase. The combined volumes will be determined at a later stage, but may exceed the specified thresholds of 80 m³ but will not exceed the 500 m³.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from (i) a watercourse	Borrow pits for the sourcing of aggregate material may be required on the WEF Site. It is not yet known the location of these in relation to watercourses however this clause may be triggered depending on the availability of aggregate locations. In addition, the construction of associated infrastructure, such as access track crossing watercourses, may require excavation and/or infilling of watercourse areas. The extent and location of the likely triggers to this listed activity will be clarified during the EIA process.
	22 (i) and (ii)	The construction of a road, outside urban areas, (i) with a reserve wider than 13.5 m or, (ii) where no reserve exists where the road is wider than 8 m.	Access tracks will be required between the turbines. These will be unsealed and will likely be between 4-9 m in width. These access tracks will be up to 9 m wide during construction, but will be reduced to 3-4 m during operation. However this will be confirmed during the EIA process.
	23 (ii)	The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares.	The Proposed Development is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, road and electrical reticulation, on-site office and substation is not yet known. It is highly likely to exceed 1 hectare. Whether it will exceed 20 hectares is not known. This clause may apply and hence has been included subject to confirmation through the EIA process.
	24	The transformation of land bigger than 1000 m² in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.	According to the available spatial data there are no designated conservation or public open space areas within the Proposed Development. However this will be clarified through the consultations with the relevant local authority during the EIA process.
	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	At present this section of the NEMBA is not yet defined so it does not apply at this time. However in the event that this comes into force during the EIA process and protected species are found to be present due regard would be given to its content.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	39 (iii)	The expansion of: (iii) bridges within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	As the route of the access tracks and infrastructure locations have not yet been determined it is possible, if bridges exist, that these may be utilised through extension to facilitate the Proposed Development.
	47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km - (i) where the existing reserve is wider than 13,5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4-9 m which will be used to access the turbines.
GN.R545, 18 June 2010 (Listing Notice 2: Scoping and EIA)	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	Construction of a WEF up to 147 MW in installed capacity. The facility is comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 3.5 MW each.
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha or more.	The Proposed Development is located on currently undeveloped land, the combined footprint of the turbines, laydown areas and substation together with the implementation of the onsite road access network may exceed 20 hectares (subject to the final design) and hence this clause may be triggered.
GN.R546, 18 June 2010 (Listing Notice 3: Basic Assessment)	4	The construction of a road wider than 4 m with a reserve less than 13.5 m. (d) In Western Cape: ii. All areas outside urban areas.	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and will likely be between 4-9 m in width. These access tracks will be up to 9 m wide during construction, but will be reduced to 3-4 m during operation. The WEF Site covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province. The WEF Site falls outside of urban areas.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	10	The construction 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 m^3 (a) In Northern Cape Province: ii. Outside urban areas, in: (ii) Areas on the watercourse side of the development setback line or within 100m from the edge of a watercourse where no such setback line has been determined. (e) In Western Cape: ii. All areas outside urban areas	Storage of fuel on the site will be required however the volume of this storage is not yet confirmed and hence this clause maybe applicable. The WEF Site falls outside of urban areas. Considering the extensive size of the WEF Site and the extent of potential watercourses within it, there is a possibility that fuel storage facilities may be located within 100m from the edge of a watercourse.
	12	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	Spatial information available indicates this clause will not be applicable however the volume of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists ecological studies. This will determine conclusively if this Listed Activity is applicable to the Proposed Development.
	13	The clearance of an area of 1 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous Vegetation. (c) In the Northern Cape and Western Cape: ii. Outside urban areas, the following: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	The volume of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists ecological studies. The study area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province. This clause may be applicable to the Proposed Development.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	14	The clearance of an area of 5 ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. In the Northern Cape and Western Cape: All areas outside urban areas.	The area of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists' ecological studies. Considering the extent of the WEF Site and the undeveloped nature of the receiving environment, it is possible that this activity will be triggered. The applicability of this activity will be determined during the EIA process.
	16 (iii) and (iv)	The construction of: (iii) buildings with a footprint exceeding 10 m² in size; or (iv) infrastructure covering 10 m² or more where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse. (d) In the Western Cape: ii. Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	The footprint of the turbines and associated infrastructure will exceed covering 50 m² in total. The location of buildings and infrastructure in relation to watercourses has not yet been determined and will be confirmed through the ongoing design and EIA process. This clause may be applicable. The study area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province.
	19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km. (a) In the Northern Cape: ii. Outside urban areas, in: (ii) Areas on the watercourse side of the development setback line or within 100m from the edge of a watercourse where no such setback line has been determined (d) In the Western Cape: ii. All areas outside urban areas.	Where existing tracks/roads exist within the WEF Site these maybe widened or lengthened to facilitate the access tracks of 4-9 m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation. The majority of the WEF Site falls outside of urban areas. Considering the extensive size of the WEF Site and the extent of potential watercourses within it, there is a possibility that roads may be upgraded and may be located within 100 m from the edge of a watercourse. The exact extents and locations for such storage facilities will be determined during the EIA process.

Table 1.2: Listed activities that form part of the Umsinde Emoyeni Grid Connection Applications (Phase 1 and 2)

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
GN.R544, 18 June 2010 (Listing Notice 1: Basic Assessment)	10 (i)	The construction 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 kV.	The grid connection will require the installation of 132 kV overhead lines. A small section of 275kV may also be required.
	11 (iii), (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m² in size; or (xi) infrastructure or structures covering 50 m² or more where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	In the event access is required over watercourses to construct the grid connection bridges maybe required. The grid connection will include an application for both the substation located on the WEF site, and the substation adjacent to the Eskom gamma facility. The building footprint of these buildings is not known and may trigger this clause. The total footprint of the infrastructure and structures is likely to exceed 50 m^2 but this will be confirmed as the design process proceeds throughout the EIA process. The location of these installations in relation to watercourses will be determined throughout the EIA process.
	13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 m³.	Storage of fuel on site, for use during the construction phase, will be required. The volume stored will be less than 500 m^3. The proposed substations are likely to require the use of transformer oils and other hazardous substances, during the operational phase. The combined volumes will be determined at a later stage, but may exceed the specified thresholds.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from (i) a watercourse	Borrow pits for the sourcing of aggregate material will be required on the Grid Connection Site. It is not yet known the location of these in relation to watercourses however this clause may be triggered depending on the availability of aggregate locations.
	23 (ii)	The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares.	The grid connection infrastructure is located on currently undeveloped land. The combined footprint of the grid infrastructure may, cumulatively, exceed 1 hectare but is likely to be less than 20 hectares. The final footprint will be confirmed through the EIA process.
	24	The transformation of land bigger than 1000 m² in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.	According to the available spatial data there are no designated conservation or public open space areas within the Project. However this will be clarified through the consultations with the relevant local authority during the EIA process.
	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	At present this section of the NEMBA is not yet defined so it does not apply at this time. However in the event that this comes into force during the EIA process and protected species are found to be present due regard would be given to its content.
	27 (ii)	The decommissioning of existing facilities or infrastructure, for – electricity transmission and distribution with a threshold of more than 132 kV;	In the event any electrical infrastructure is required to be removed to be upgraded this clause may be triggered. This will only be determined during the EIA.
	38	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kV and the development footprint will increase.	The grid connection will install a network of infrastructure for the transfer for electricity to the existing National Grid. Depending in the tie in arrangement with the existing Eskom substation there may be a need to expand or alter the existing Eskom Transmission infrastructure within and adjacent to the substation.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	39 (iii)	The expansion of: (iii) bridges within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	In the event a bridge is located which is required to access the construction route but requires upgrading this maybe expanded. It is not yet known if this will be required at this stage.
	47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km - (i) where the existing reserve is wider than 13.5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	Where roads are present and may require widening for access reasons during construction this clause maybe applicable.
GN.R545, 18 June 2010 (Listing Notice 2: Scoping and EIA)	8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kV or more, outside an urban area or industrial complex.	A 400 kV line will be required at least as a new turn-in from the gamma substation to an existing Eskom 400 kV line. The voltage of other lines will be confirmed during the detail electrical engineering design process.
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha or more.	The footprint of the grid connection infrastructure is not yet known and the need for this clause will be confirmed through the detailed design.
GN.R546, 18 June 2010 (Listing Notice 3: Basic Assessment)	4	The construction of a road wider than 4 m with a reserve less than 13.5 m. (d) In Western Cape: ii. All areas outside urban areas.	Where roads are present and may require widening for access reasons during construction this clause maybe applicable. The site covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province. The Grid Connection Site falls outside of urban areas.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	10	The construction 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 m^3: (a) In Northern Cape Province: ii. Outside urban areas, in: (ii) Areas on the watercourse side of the development setback line or within 100m from the edge of a watercourse where no such setback line has been determined. (e) In Western Cape: ii. All areas outside urban areas.	Storage of fuel on site, for use during the construction phase, will be required. The volume stored will be less than 500 m^3. The proposed substations are likely to require the use of transformer oils and other hazardous substances, during the operational phase. The combined volumes will be determined at a later stage, but will not exceed the specified 80 m^3 thresholds. The majority of the Grid Connection Site falls outside of urban areas. Considering the extensive size of the Grid Connection Site and the extent of potential watercourses within it, there is a possibility that fuel storage facilities may be located within 100 m from the edge of a watercourse. The exact volumes and locations for such storage facilities will be determined during the EIA process.
	12	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	Spatial information available indicates this clause will not be applicable however the volume of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists ecological studies. This will determine conclusively if this clause is applicable to the grid connection infrastructure.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	13	The clearance of an area of 1 ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (c) In the Northern Cape and Western Cape: ii. Outside urban areas, the following: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	The area of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists' ecological studies. Considering the extent of the Grid Connection Site and the undeveloped nature of the receiving environment, it is possible that this activity will be triggered. The applicability of this activity will be determined during the EIA process. The site covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province.
	14	The clearance of an area of 5 ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation: (a) In the Northern Cape and Western Cape: i. All areas outside urban areas.	The area of vegetation to be removed, and the nature of this vegetation, will be determined through the ongoing design and the specialists' ecological studies. Considering the extent of the Grid Connection Site and the undeveloped nature of the receiving environment, it is possible that this activity will be triggered. The applicability of this activity will be determined during the EIA process.
	16 (iii) and (iv)	The construction of: (iii) buildings with a footprint exceeding 10 m² in size; or (iv) infrastructure covering 10 m² or more where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse. (d) In the Western Cape: ii. Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	The majority of the Grid Connection Site falls outside of urban areas. Considering the extensive size of the Grid Connection Site and the extent of potential watercourses within it, there is a possibility that construction of infrastructure and buildings may be located within 32 m from the edge of a watercourse. The site covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province.

Relevant Notice	Activity No.(s)	Listed Activity	Description of Proposed Development
	19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km. (a) In the Northern Cape: ii. Outside urban areas, in: (ii) Areas on the watercourse side of the development setback line or within 100m from the edge of a watercourse where no such setback line has been determined (d) In the Western Cape: ii. All areas outside urban areas.	Where existing tracks/roads exist within the Grid Connection Site these maybe widened or lengthened to facilitate the access tracks. The majority of the Grid Connection Site falls outside of urban areas. Considering the extensive size of the Grid Connection Site and the extent of potential watercourses within it, there is a possibility that roads may be upgraded and may be located within 100 m from the edge of a watercourse. The exact extents and locations will be determined during the EIA process.

1.2.4 Scoping

The scoping phase of the EIA process refers to the process of determining spatial and temporal boundaries for the EIA, along with determining those potential impacts that should be assessed in the EIA. In broad terms, this involves three important activities:

- Confirming the process to be followed and opportunities for stakeholder (including I&AP) engagement;
- Clarifying the scope of the project to be assessed; and
- Identifying the key issues to be addressed in the EIA phase and the approach to be followed in addressing these issues.

This is done through consultation with:

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

The scoping phase needs to first set out the existing environment within which a proposed development is to be located. This is done through a review of relevant background literature and information on the local area as well as site visit and survey results to date.

The existing environment can be reviewed in combination with the nature of a proposed development, in this case WEFs and grid connection infrastructure. Through this process, the scoping phase can identify the likely impacts of the proposed development requiring assessment and therefore set out a method by which these potential impacts will be assessed.

The primary objective for the Draft Scoping Report is to present key stakeholders with an overview of the Proposed Development that require assessment in the EIA. Its availability in the public domain allows for items that may require assessment to be identified and raised to the project team to be considered for inclusion in the EIA process.

In terms of legal requirements, a crucial objective of the Draft Scoping Report is to satisfy the requirements of Regulations 28 and 29 of the NEMA EIA Regulations. These sections regulate and prescribe the content of the Draft and Final Scoping Reports and specify the type of supporting information that must accompany the submission of the Scoping Report to the authorities. Regulations 54 to 57 relate to the Public Participation Process (PPP) and, specifically, the registration of I&APs and submissions from them. Table 1.3 shows how and where the legal requirements are addressed in this Draft Scoping Report.

Table 1.3 Legal Requirements for Scoping Reports

Section	Requirement for Scoping Report	Where this is provided
28 (1)(a)	Details of the EAP who prepared the report and their expertise	Chapter 1: Section 1.4
28 (1)(b)	Description of the proposed activity	Chapter 2: Sections 2.5 and 2.6
28 (1)(c)	Description of any feasible and reasonable alternatives	Chapter 1: Section 2.7
28 (1)(d)	Description of the site	Chapter 2: Section 2.2 and 2.3
28 (1)(e)	Description of the environment which may be affected (i.e. baseline)	Chapters 4-12
28 (1)(f)	Identification of all legislation and guidelines considered	Chapter 1: Section 1.2.1 and Chapters 4-12

Section	Requirement for Scoping Report	Where this is provided
28 (1)(g)	Description of environmental issues and potential impacts, including cumulative impacts	Chapters 4-12
28 (1)(h)	Details of public participation including: Steps taken to notify potential interested and affected parties (I&APs)of the application; Proof of notice boards, advertisements and notices notifying potential I&APs; List of all persons or organisations identified and registered in terms of regulations 55 as I&Aps; and Summary of the issues raised by I&APs, dates receive and response by the EAP	Chapter 1, section 1.2.6, and Appendix 1.1
28 (1)(i)	Description of the need and desirability of the proposed activity	Chapter 2: Section 2.8
28 (1)(j)	Description of identified alternatives	Chapter 2: Section 2.7
28 (1)(k)	Copies of representations and comments received	Appendix 1.1
28 (1)(l)	Copies of any minutes of meetings held by the EAP which records the views of the participants	Appendix 1.1
28 (1)(m)	Any responses by the EAP to the representations and comments received	Appendix 1.1
28 (1)(n)	Plan of study for EIA which sets out the proposed approach including (i) the tasks that will be undertaken, including specialist reports and the manner such tasks will be completed; (ii) stages at which the competent authority will be consulted; (iii) description of the methods of assessment; particulars of the public participation process.	Chapter 1
28 (1)(o)	Any specific information required by the competent authority	Appendix 1.2
28 (1)(p)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act	None required
28 (2)	Guidelines applicable to the kind of activity which is the subject of the application	Chapter 3 – 12 inclusive
28 (3)	Detailed written proof of an investigation as required by 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives as contemplated in sub regulation (1)(c) exist	Chapter 2
29 (a)	Copies of representation and comments received in connection with the application	Appendix 1.1
29 (b)	Copies of the minutes of meetings held by the EAP with I&APs and other role players which record the views of participants	Appendix 1.1
29 (c)	Any responses by the EAP to those comments, representations and views	Appendix 1.1

This Draft Scoping Report is available for public comment (Section 1.2.6). Following completion of the comment period and review by the competent authority, the Final Scoping Report will be completed.

1.2.5 Assessment Techniques for the EIA

Each of the specialist assessments will follow 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.

1.2.5.1 Baseline Description

In order to evaluate the potential environmental impacts, information relating to the existing environmental conditions will be collected through field and desktop research; this is known as the baseline. 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 will form the current and future baseline for the impact assessments.

The baseline is 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.

Within each specialist assessment, the methods of data collection will have been discussed with the relevant I&APs. Data will be collected from public records and other archive sources and where appropriate field surveys will also be carried out.

1.2.5.2 Identification of Potential Impacts

The identification of potential impacts will cover 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 to be addressed in the EIA based on their experience and knowledge of the type of development proposed and the local area. Their inputs have informed the scope for the EIA.

Each specialist assessment will consider:

- Direct and indirect impacts;
- Short, medium and long term impacts;
- Permanent and temporary impacts;
- Likelihood of an impact occurring (i.e., very likely, likely, or unlikely); and
- Cumulative impacts.

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

1.2.5.3 Assessment of Potential Effects

The potential impact that the Proposed Development 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).

The methodologies for undertaking these assessments will vary between the topics under consideration and are introduced in relation to each topic area in chapters 4-12 of this Draft Scoping Report.

The assessment of impacts will be performed for each component part of the Proposed Development as an individual project. These four component parts being:

- Umsinde Emoyeni WEF: Phase 1;
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1;
- Umsinde Emoyeni WEF: Phase 2; and
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2.

1.2.5.4 Cumulative Assessment

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.

New proposals for wind energy development have been stimulated by the policy support shown by the South African Government. The impacts of all existing WEFs, approved developments and applications received, within a defined radius, will be considered in the EIA. Existing developments will form part of the baseline environment and as such in combination impacts will be assessed in the main impact assessment section of the Draft and Final EIAR. The impacts of the Proposed Development in combination with other approved developments, or developments for which applications have been received, will be specifically assessed in the cumulative impacts section of the Draft and Final EIAR. The appropriate extent of cumulative work relevant to each specialist assessment will be agreed during the consultation process.

As the Proposed Development consists for four components which will be assessed individually as stated in Section 1.2.5.3 above, there is potential for cumulative impacts between the four components. As such each component will be assessed both individually, and cumulatively.

1.2.5.5 Mitigation

The EIA will propose measures to avoid, reduce or remedy significant adverse impacts which might be identified; these are termed mitigation measures. Where the assessment process identifies any significant adverse impacts, mitigation measures will be 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 sighting of turbines to avoid certain sensitive receptors

would become 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 will identify appropriate mitigation measures (where relevant).

1.2.5.6 Residual Impacts

The assessment process will conclude with an examination of residual impacts after mitigation has been applied, i.e., the overall predicted (potential) impacts of the Proposed Development.

1.2.6 Consultation and Participation

1.2.6.1 Scoping Process

The PPP will take place throughout the EIA process (which includes the Scoping phase and the EIA phase). The main purpose of the PPP is:

- To identify I&APs that will be affected by the Proposed Development;
- To identify parties that have an interest in the Proposed Development and/or the environment under consideration;
- To establish a record of the procedure by which I&APs were identified and afforded the opportunity to participate at all appropriate stages of the process;
- To provide opportunities to I&APs to express their views regarding the scope and content of the environmental reports, including alternatives and issues that are being investigated;
- To provide an opportunity for I&APs to verify that their issues were included and considered in the EIA; and
- To maintain a record of all correspondence and views of I&APs.

Evidence of consultation conducted to date is included in Appendix 1.1.

I&AP Identification

The identification of I&APs and/or stakeholders is has been carried out in three separate tasks, namely:

- Those identified during the screening process (i.e., by review of available stakeholder information);
- Those identified as directly affected landowners within the Proposed Development Site; and
- Those who registered as a result of the advertising and notification process.

Landowners have been identified through three main mechanisms, namely:

- Available databases from previous projects within the vicinity of the Proposed Development Site;
- Landowner information obtained from a detailed deeds search; and
- One on one consultation with the landowners within the Proposed Development Site.

I&APs are registered on a Microsoft Excel database which has been split into a landowner database and a database containing the information of all other key stakeholders (referred to as key I&APs). The I&AP databases include the full contact details of all parties identified and contacted during the EIA process and all parties who replied to

advertisements and other notices, or contacted the PPP consultant regarding the Proposed Development.

The I&AP databases will be expanded and updated throughout the EIA process.

Public Consultation Events

In accordance with the requirements of Regulation 54 of GN R. 543, the following public consultation events have been, and are proposed to be, undertaken:

Initial Notification (Complete)

- Site notice placement (60 notices, 30 in English and 30 in Afrikaans) at key points in the vicinity of the Proposed Development Site (see Appendix 1.1 for locations);
- Distribution of notification letters, faxes and/or emails (letters in English and Afrikaans, including a map of study area, a Background Information Document (BID), and registration/ comment form) to all pre-identified I&APs;
- Advertisements (in English and Afrikaans) placed in the following newspapers: Die Courier; Die Burger; and the Graaff-Reinet Advertiser to accommodate the span of the Proposed Development Site; and
- Placement of A3 posters (in English and Afrikaans) at public locations: Murraysburg and Richmond police stations; Murraysburg and Richmond post offices; Murraysburg clicnic and hospital; Murraysburg local municipal office; and Murraysburg Farmers' Co-operative;
- Placement of the BID on website of EIMS (www.eims.co.za).

Scoping Phase

- This Draft Scoping Report will be made available for public review at the at Murraysburg local municipal office, Murraysburg Farmers' Co-operative, and the Richmond police station, and library, Ubuntu and Beaufort West local municipalities, as well as the EIMS website (www.eims.co.za). The comment period for reviewing the Draft Scoping Report will be 40 days;
- Notification letters, faxes and/or emails will be distributed to registered I&APs (including all affected landowners) regarding the availability of the Draft Scoping Report for comment; and
- A public meeting to present findings of the Draft Scoping Report will be arranged during the allocated comment period and the details thereof included in the notification regarding the availability of the Draft Scoping Report.

Consultation with Authorities

All environmental documentation will be made available to the competent authority (the DEA) as well as the:

- Western Cape Department of Environmental Affairs and Development Planning (DEADP);
- Northern Cape Department of Environmental Affairs and Nature Conservation (DENC);
- Beaufort West Local Municipality; and
- Ubuntu Local Municipality.

Other relevant authorities such as (but not limited to) the District Municipalities, Department of Mineral Resources, and Department of Water Affairs are included in the I&AP database, and will receive notification regarding the availability of the Draft Scoping Report and upcoming public meeting. Additionally, consultation with relevant authorities on a one-on-one basis will be initiated where necessary during the course of the EIA process.

Issues and Response Report

An Issues and Responses Report (IRR) has been compiled for the Proposed Development. This report will represent a "living" record of the public consultation process. The IRR will capture the following information:

- Date of comment/question;
- Method of comment/question (e.g., public meeting, letter, etc.);
- Name and organisation of the person who made the comment/asked the question;
- The comment/question. The IRR will be grouped according to the themes of the issues and concerns raised; and
- An answer to the question/response to the comment or a reference as to where such information may be obtained in the Scoping Report and EIR.

The final IRR will include a column which will reflect the associated section in the Draft Environmental Management Plan (EMP) and/or FEIAR in which the issue is addressed.

Review of Draft Scoping Report

This stage in the EIA process entails the release of the Draft Scoping Report for a 40 day public review & comment period. All I&APs on the I&AP databases (landowners and key I&APs) will be notified in writing, via letter, fax and/or email of the availability of the Draft Scoping Report for review.

The following mechanisms and opportunities will be utilised to notify I&APs of the availability of the Draft Scoping Report for comment:

- Emails, faxes, and/or letters notifying I&APs of the release of the Draft Scoping Report and the duration of the comment period;
- Placement of the Draft Scoping Report on the website (www.eims.co.za); and
- Placement of the Draft Scoping Report at Murraysburg local municipal office, Murraysburg Farmers' Co-operative, and the Richmond police station, and library, Ubuntu and Beaufort West local municipalities, as well as the website (www.eims.co.za)

Final Scoping Report

Further notification regarding the submission of the Final Scoping Report to the DEA, towards their decision making, will be distributed to all registered I&APs via letters, faxes and/or emails. In addition I&APs will be informed of any material changes made to the Draft Scoping Report which are incorporated in the Final Scoping Report. I&APs will have an opportunity to comment on the Final Scoping Report, with any comments submitted directly to the DEA (details of where and to whom to send such comments will be included in the Final Scoping Report availability notification letter).

To ensure ongoing access to information, copies of the Final Scoping Report will be placed at the Murraysburg local municipal office and Farmers' Co-operative as well as the Richmond police station and library. The Final Scoping Report will also be available at the Ubuntu and Beaufort West local municipalities and on the website (www.eims.co.za).

This step marks the end of the Scoping Phase. Once the DEA has reviewed the Final Scoping Report and made a decision to allow the proponent to continue with the EIA, the EIA Phase will commence.

1.2.6.2 EIA Phase

This stage in the EIA process entails the drafting of specialist studies, taking into account public and stakeholder comments raised during the Scoping phase, and the compilation of these into a DEIAR. The DEIAR will be released for a 40 day long public review &

comment period. All I&APs on the I&AP databases (landowners and key I&APs) will be notified in writing, via letter, fax and/or email of the availability of the DEIAR for review. The following methods will be utilised to notify registered I&APs of the availability of the DEIAR and associated public meeting to present the findings of the report:

- The DEIAR will be made available for public review at the Murraysburg local municipal office, Murraysburg Farmers' Co-operative, and the Richmond police station, the Ubuntu and Beaufort West local municipalities, as well as the website (www.eims.co.za). The comment period for reviewing the DEIAR will be 40 days;
- Notification letters, faxes and/or emails will be distributed to registered I&APs (including all affected landowners) regarding the availability of the DEIAR for comment; and
- A public meeting to present findings of the DEIAR will be arranged and the details thereof included in the notification regarding the availability of the DEIAR.

The DEIAR will then be finalised and notifications issued to all registered I&APs via letters, faxes and/or emails regarding the submission of the FEIAR to the DEA. In addition I&APs will be informed of any material changes made to the DEIAR which are incorporated in the FEIAR. I&APs will have an opportunity to comment on the FEIAR, with any comments submitted directly to the DEA (details of where and to whom to send such comments will be included in the FEIAR availability notification letter).

Copies of the FEIAR will be placed at the Murraysburg local municipal office and Farmers' Co-operative as well as the Richmond police station and library. The FEIAR will also be available at the Ubuntu and Beaufort West local municipalities and on the project website (www.eims.co.za).

This step marks the end of the EIA Phase. Once the DEA has reviewed the FEIAR, they will make a decision on the report and subsequently decide on whether or not to grant the Environmental Authorisation.

1.2.6.3 Ongoing Communication

Throughout the project, stakeholders will be encouraged to get into contact with the PPP team to raise issues, ask questions or make suggestions. Communication will be via telephone or in written form. Once a contact has been made, the issue/question/suggestion will be logged on the Issues and Responses Report and a response will be provided to the stakeholder.

Registration of I&APs will continue throughout the EIA process however comments on the specific draft reports, such as the Draft Scoping Report and DEIAR need to be received within the specified time periods to ensure they can be taken into account in the Final Scoping Report and FEIAR respectively.

1.2.6.4 Informing stakeholders of the Decision to Grant of Refuse Environmental Authorisation

At the end of the EIA phase, after submission of the Final EIA Report, the relevant competent authority (DEA) will issue an Environmental Authorisation, should the project be approved. Notification regarding the DEA's decision and the appeal procedure will be distributed to all registered I&APs within 12 days of the issuing of the decision. This task will include the advertisement of the Environmental Authorisation in the same newspapers used to advertise the initial project notifications.

1.3 Project Proponents

1.3.1 Emoyeni Wind Farm Project Proprietary Limited (EWFP)

EWFP is a Special Purpose Vehicle (SPV) established under Windlab Developments South Africa (Pty) Ltd (WDSA), which is a wholly-owned subsidiary of Windlab Systems (Pty) Ltd (Windlab).

Windlab is an international wind energy development company which was established in 2003 through the commercialisation of wind mapping technology developed by Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). Making use of wind mapping technology and a suite of world-leading atmospheric modelling and wind energy prospecting tools such as WindScape™ and RaptorNL™, Windlab is able to successfully identify, secure and develop commercial wind farm sites.

Windlab has a growing project portfolio of over 6,500 MW in varying stages of development and implementation with projects in Canada, the United States of America, Australia, New Zealand and South Africa. In 2007 and 2008, Windlab established three subsidiary companies in the United States, Canada and South Africa respectively. WDSA, the South African subsidiary of Windlab is therefore responsible for developing wind energy projects in South Africa, in accordance with the Department of Energy's (DoE) Renewable Energy Independent Power Producers Procurement Program (REIPPPP). The REIPPPP is described further in Section 3.2 of this report.

WDSA has been involved with a number of wind energy developments in South Africa both independently as well as in partnerships with other wind energy developers. Examples include two wind energy projects which were awarded preferred bidder status in Round 2 of the REIPPPP. The first is the 91 MW West Coast One project proposed near Vredenburg in the Western Cape, and the second is the 138 MW Amakhala Emoyeni Phase 1 project proposed near Bedford in the Eastern Cape.

Through an Special Project Vehicle (SPV) Special Energy Project (Pty) Ltd, WDSA is also the proponent for the Ishwati Emoyeni WEF and associated grid infrastructure, the development boundary for which overlaps with and is adjacent to this Umsinde Emoyeni Proposed Development Site.

In accordance with the REIPPPP bid requirements, WDSA have established EWFP as a SPV to obtain the Environmental Authorisation and preferred bidder status for each of the proposed two phases of the Umsinde Emoyeni Wind Energy Facility.

1.4 The EIA Project Team

1.4.1 Details of the Environmental Assessment Practitioner (EAP)

The coordination and management of the EIA process (including scoping) is being conducted by Arcus with the lead EAP being Jennifer Slack.

Arcus is a specialist environmental consultancy providing environmental services to the renewable energy market. We have advised on over 150 renewable energy projects around the globe through both our EAP and in-house specialist services. Our team consists of specialists in the field of:

- Ecology;
- Avifauna;
- Bats;
- Cultural heritage;
- Noise;
- Hydrology and hydrogeology; and
- GIS.

Jennifer is an environmental consultant and EAP with over ten years' experience in the field of environmental consultancy. She has a Masters Degree in Environmental Impact Assessment and Management. Throughout her professional career she has undertaken EIAs for a variety of large complex projects including a 1.1 gigawatt WEF, a 73 hectare housing and urban regeneration scheme and a multi-fuelled thermal generation power plant. Jennifer has provided environmental assessment inputs to renewable energy projects in the Western, Eastern and Northern Cape Provinces in South Africa. She is a member of the South African branch of the International Association of Impact Assessment (IAIA-SA) and a certified EAP-SA. Jennifer's CV is included in Appendix 1.3.

Jennifer is being assisted with the Public Participation Process of the Proposed Development EIA process by EIMS.

1.4.2 EIA Team

The EAP has assembled a team of technical specialists for undertaking the scoping and EIA of the potential impacts of the Proposed Development. The topics will be included in the EIA for the Proposed Development are listed in column 3 of Table 1.4. These topics have been identified as relevant to the Proposed Development due to the experience of the EAP in undertaking EIA for this type of project, and consultation with the listed specialists who are familiar with the locality and this nature of development. Should further topics be identified in the scoping process through consultation, these will be considered for inclusion in the scope of the EIA.

These specialists have been selected based on their experience in the field of EIA and of renewable energy projects, and the locality of the Proposed Development.

Table 1.4 below prescribes the roles and responsibilities of parties involved in the EIA.

Table 1.4 EIA Project Team

Name	Organisation	Role
Jennifer Slack	Arcus Consulting	Project Leader (EAPSA)
Liam Whitlow and Nobuhle Hughes	EIMS	Public Participation Coordination and Management of I&AP process.
Andrew Pearson and Mike Armitage	Arcus Consulting	Bird Impact Assessment and Monitoring
Kate McEwan	NSS Environmental	Bat Impact Assessment and Monitoring
Dr Jane Turpie and Simon Todd	Anchor Environmental	Terrestrial Ecological Impact Assessment (Flora and Fauna)
Dr Tim Hart	ACO Associates	Heritage Impact Assessment
Dr Almond	via ACO Associates	Palaeontology Assessment
Dr Brian Colloty	Scherman Colloty and Associates	Aquatic/ Wetland Assessment
Mome de Jager	Enviro-Acoustic Research	Noise Impact Assessment
Bernard Oberholzer	Bernard Oberholzer Landscape Architects	Visual Assessment
Quinton Lawson	Meirelles Lawson Burger Architects	
Dr JH van der Waals	Terrasoils	Soil and Agriculture
Tony Barbour	Tony Barbour Environmental Consulting and Research	Social Impact Assessment

1.5 Structure of this Report

This report is set out as follows:

- Chapter 1 – Introduction to the Proposed Development, the Scoping and EIA Process, the project proponents and the EIA project team;
- Chapter 2 – The Proposed Development, including an overview of the site location, the proposed WEF and grid connection components, consideration of alternatives and the need for development;
- Chapter 3 – Review of policy and drivers for the Proposed Development;
- Chapters 4 – 12 – Specialist assessments including visual, terrestrial ecology (flora and fauna), bats, wetlands and freshwater, avifauna, soils and agriculture, cultural heritage, archaeology and palaeontology, noise and social. For each of these specialisms the following is provided:
    - Introduction;
    - Baseline survey methods;
    - Description of baseline environment;
    - Potential impacts;
    - Relevant Stakeholders/ Consultees; and
    - Assessment methods proposed for the EIA; and
- Chapter 13 – Conclusions and Next Steps.

2 THE PROPOSED DEVELOPMENT

2.1 Introduction

There are four components to the Proposed Development, comprising the WEF and associated grid connection, representing two development phases.

- Umsinde Emoyeni WEF: Phase 1;
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1;
- Umsinde Emoyeni WEF: Phase 2; and
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2.

The two phases of the WEF will each be located within the WEF Site Boundary as shown on Figure 1.2. The two phases of the grid connection will each be located within the Grid Site Boundary as shown on Figure 1.3. It should be noted that at present the starting point of the grid connection is not yet known, this will start somewhere within the WEF Site. As such the Grid Connection Site Boundary includes the entirety of the WEF Site Boundary. The grid connection (phases 1 and 2) will start within the WEF and will take a linear route through the Grid Connection Site.

2.2 Site Location

The Proposed Development Site is located near the town of Murraysburg in the Western Cape Province, with a small portion of the Proposed Development Site transcending into the Northern Cape Province.

The majority of the Proposed Development Site is located within the Beaufort West Local Municipality (BWLM), which is one of three local municipalities that make up the Central Karoo District Municipality (CKDM) in the Western Cape Province. A small section of the Proposed Development Site is also located in the Ubuntu Local Municipality within the Northern Cape Province. The Proposed Development Site is located approximately 7 km northeast of the closest settlement, the town of Murraysburg.

The location of the Proposed Development Site is shown on Figure 1.1.

2.3 Site Description

The Proposed Development Site occupies hilly terrain with ephemeral and seasonal drainage features. The altitude varies between 1200 m and 1900 m above mean sea level from west to east with the geology dominated by mudstone, shale and sandstone with numerous dolerite intrusions. The majority of the site is characterised by a land use dominated by extensive sheep grazing with small occurrences, generally to the south, of crop production in alluvial deposits in drainage features. The soils are generally shallow and the annual rainfall is low (approximately 300 mm) and erratic.

The Brak River is the principal watercourse on the Proposed Development Site, running through the far western part. A number of tributaries of the Brak River also flow through the Proposed Development Site, namely:

- Skietkuilspruit (far western part of the grid connection site);
- Snynderskraal River (eastern part of the grid connection site, to the west of the WEF boundary);
- Buffels River (from east to west through the southern part of the WEF site);
- Bakensklip (from east to west, through the northern part of the WEF site) and
- Several unnamed tributaries.

The N1 national road passes through the far western part of the Proposed Development Site, in a southwest-northeast orientation, where it intersects the R63 regional route. The R63 runs from Victoria West (to the northwest) to Graaff-Reinet (to the southeast) through Murraysburg and passes through the southern part of the Proposed Development Site. Three other minor local roads pass through the Proposed Development Site in a northerly direction towards Richmond; one through the grid connection site (to the west of the WEF Site), one through the centre of the WEF Site and one which passes in and out of the eastern WEF Site.

The Proposed Development Site covers a total area of approximately 93,000 hectares, of which only a small proportion will be occupied by the final Proposed Development footprint.

2.4 Overview of Wind Energy Generation

Wind turbines are used to harness the energy contained in the wind and convert this into a useable form, electricity. WEFs consume no fuel during operation and have no direct emissions as a result of electricity production. The economies of a WEF depend upon the wind resources available at a site and as such detailed information on speed, flow, direction and regularity of wind are vital when identifying locations and layouts for WEFs.

Wind turbines are mounted on a tower to elevate the generators above the ground where wind speeds are higher and the wind resource is more consistent and less turbulent. The kinetic energy of the wind is then used to turn the turbine blades, three of which are joined together to form a rotor. This movement produces mechanical power which is transmitted to the generator within the nacelle (on the top of the tower) either via gearbox or through a direct drive design of turbine. A typical wind turbine is presented in Figure 2.1, identifying the key components of a wind turbine.

2.5 The Proposed Wind Energy Facility

The WEF will be developed in two phases. Each phase will comprise up to 98 wind turbines and will have a contracted capacity of up to 140 MW, and an installed capacity of up to 147 MW in line with the REIPPPP. A separate Environmental Authorisation will be sought for each phase of the WEF.

The purpose of a wind energy facility is to harness energy from the wind. It is important that wind turbines are sited in the optimum position to maximise the wind yield whilst minimising environmental impacts.

The optimum layout of a wind energy facility depends on a range of criteria. These vary depending on the type and size of turbine as well as the local topography and the turbulence which may be created by surface features. Turbine manufacturers generally recommend that turbines should be spaced between three and six rotor diameters apart depending on the prevailing wind direction, turbine type and site characteristics.

2.5.1 WEF Components

The WEF will comprise components described below. It should be noted as the design of the Proposed Development is not yet finalised, all dimensions are maximums as is required by the EIA process. The final design may include infrastructure which is of equal or less than dimensions to those stated below but not more than.

2.5.1.1 Turbines

Each phase of the WEF will comprise up to 98 turbines.

At this stage it is envisaged that the turbines will each have a capacity to generate between 1.5 and 3.5 MW of power and each turbine will have a maximum height to blade

tip of 180 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to 120 m and a rotor diameter of up to 130 m. A typical wind turbine is presented in Figure 2.1. The exact turbine model has not been selected yet 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. At average wind speeds greater than approximately 28 m/s the turbines would will automatically turn the angle of the blade to reduce energy capture (this is known as 'pitching') and stop turning to prevent damage.

Each turbine will require a transformer and, depending on the selected model of turbine, this will be either located within the turbine tower or adjacent to the turbine on a concrete plinth.

The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 30 m by 30 m in total[20] (which includes the maximum total area that may need to be disturbed during construction of the foundation), and be typically up to 3 m deep and may include concrete and steel plinths depending upon local ground conditions.

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

The location of the turbines within the WEF Site has not yet been determined and will be confirmed during the EIA process following assessment of technical and environmental constraints.

2.5.1.2 Hardstanding Areas

A hardstanding area of up to 45 m by 25 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.

2.5.1.3 Laydown Areas

Up to three additional temporary laydown areas of up to 150 m by 60 m in size will be required for equipment and component storage during construction. These areas will be levelled and compacted and used for component storage.

2.5.1.4 Electrical Cabling and Onsite Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to a 33/ 132 kV onsite substation. Where possible this will be underground but the feasibility of this will be confirmed as the design progresses. The onsite substation will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing National Grid. At this stage it is not clear which components of the onsite substation will form part of the WEF, or part of the grid connection, and hence it will be assessed for its environmental impacts in all four applications.

[20] Note this includes an increase in the 20 m by 20 m stated on the application forms submitted in April 2014. The 20 m by 20 m is the approximate area of the turbines foundation, however an area of up to 30 m by 30 m will need to be cleared for the installation of the turbines base, as such for the EIA we will be assessing a worst case scenario of 30 m by 30 m. Whilst this is an amendment to the application form it does not alter the Listed Activities applied for and will be assessed as the worst case at the EIA stage.

2.5.1.5 Access

The turbine locations will be accessed through a network of unsealed tracks which will be established across the WEF Site. These access tracks will be up to 9 m wide during construction, depending on local topography, but will be reduced to between 3 m and 4 m during operation. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access tracks will be upgraded and utilised where possible, as will existing watercourse crossings. Some of the aggregate required for the construction of the onsite tracks may be sourced from borrow pits within the Proposed Development Site with additional material imported as required.

If required an application will be lodged with the Department of Mineral Resources in regard to this activity.

2.5.1.6 Compound

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

2.5.1.7 Ancillary Equipment

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

- Anemometer masts;
- Security fencing; and
- CCTV monitoring towers.

2.5.2 Description of Construction Phase

It is estimated that construction will take approximately 18 - 24 months subject to the final design of the scheme, 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 tracks and passing places;
- Enabling works to sections of the public highway highway within the WEF Site (if required) to facilitate turbine delivery;
- Construction of the contractors' compound;
- Construction of the crane pads;
- Construction of the turbine foundations;
- Construction of the substation building;
- Excavation of the cable trenches and cable laying;
- Delivery and erection of wind turbines;
- Erection of electricity distribution line;
- Testing and commissioning of the wind turbines; and
- Site restoration.

Some of these operations will be carried out concurrently, although predominantly in the order identified, in order to minimise the overall length of the construction programme. Construction will be phased such that the civil engineering works will be continuing in some parts of the site whilst wind turbines are being erected elsewhere. Site restoration will be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

Based on experience from other WEFs the construction phase is likely to create approximately 300 employment opportunities. Of this total, approximately 25% will be available to skilled personnel (engineers, technicians, management and supervisory),

15% to semi-skilled personnel (drivers, equipment operators) and 60% to low skilled personnel (construction labourers, security staff). The number and nature of employment opportunities will be refined as the development process progresses.

2.5.3 Description of Operational Phase

The Proposed Development will be designed to have an operational life of up to 25 years. The current REIPPPP set out by the DoE grants a Power Producer Agreement (PPA) for 20 years. During operation of the Development, the large majority of the WEF Site will continue in agricultural use as it is currently. The only Development related activities on-site will be routine servicing and unscheduled maintenance, as detailed in the following sections.

Based on experience from other WEFs the operational phase is likely to create approximately 75 permanent employment opportunities. Of this total approximately 80% (60) will be low and medium-skilled and 20% (15) will be high skilled positions. The number and nature of employment opportunities will be refined as the development process progresses.

2.5.3.1 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 twice per year 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 and oil and other consumables replaced at regular intervals. Other visits to the site will take place approximately once per week to ensure that the turbines are operating 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.

2.5.3.2 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.

2.5.4 Description of Decommissioning Phase

At the end of the operation phase, the Proposed Development will be decommissioned, or may be repowered i.e. redesigned and refitted so as to operate for a longer period. 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 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.

2.6 Grid Connection Associated with the WEF

The electricity generated from the WEF will need to be transferred from the onsite substation to the existing National Grid. As noted in Section 2.5.1.4 it is not clear if the onsite substation will need to be part of the WEF applications or the grid components, and as such will be included and assessed in all applications.

Eskom has an existing grid network in the area and it is proposed that the electricity will be transferred to the existing Eskom Gamma substation via a system of 132 kV overhead power lines. From the Gamma substation the energy will be transferred via a new short section of power line to the existing high-voltage lines of the National Grid.

The type of structures which will support the overhead lines is yet to be determined and may include:

- Concrete, steel or wood monopoles;
- Guy line supported steel structures;
- Free standing metal lattice towers; or
- Multi-pole structures such as H-towers or K-towers.

The exact route of the power lines and grid connection has not yet been determined and will again be informed by the EIA process and assessment of technical and environmental constraints. The route for the 132 kV lines will include a servitude corridor of up to 73 m in width. The grid connection infrastructure for the two Phases of the WEF will follow the same route to the Gamma substation if both Phases are successfully approved. At this stage it is recommended that the proposed route of the overhead line follows existing linear infrastructure as far as possible as this will potentially reduce the impacts associated with its construction and operation however this will be confirmed prior to submission of the DEIAR.

At the Eskom Gamma substation the distribution overhead lines will connect into a newly constructed 400/132 kV substation yard which will be located on a concrete foundation covering up to 600 m by 600 m. This will include transformers and switch gear required to connect the energy into the existing National Grid network. A 400 kV transmission line turn-in intended to connect the substation with the nearby 400 kV transmission lines will require a servitude corridor of up to 55 m in width.

It is possible that if the adjacent Ishwati Emoyeni WEF (DEA Application Reference: 12/12/20/2351) is authorised and successful within the REIPPPP in advance of or at the same time as Umsinde Emoyeni, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect Umsinde Emoyeni to the National Grid and thus is likely to reduce any environmental impacts.

Given the above uncertainties at this stage, the scope of the grid connection will be defined further with Eskom as the project progresses.

2.7 The Need for the Development

Wind energy facilities 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 wind energy facilities in South Africa hold the potential to invest in the economic development of the areas in which they are located through the requirements of the REIPPPP.

2.7.1 Climate Change

The scientific consensus on climate change is that climate is changing and that these changes are in large part caused by human activities[21]. 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[22]:

- 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;
- 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 between 2000 and 2009.

As explained in National Treasury's Carbon Tax Policy Paper (May, 2013)[23], addressing the challenges of climate change through facilitating a viable and fair transition to a low-

[21] http://adsabs.harvard.edu/abs/2013ERL.....8b4024C (accessed 18th June 2014)
[22] http://www.cop17-cmp7durban.com/en/south-africa-on-climate-change/effects-of-climate-change-on-south-africa.html (accessed 18th June 2014)

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 inequality[24].

Under the Copenhagen Accord[25], South Africa pledged in 2009 to ensure that its greenhouse gas emissions deviate from the business-as-usual growth trajectory by around 34 per cent by 2020 and 42 per cent by 2025.

Renewable energy projects will play a significant role in assisting the transition to a low-carbon economy.

2.7.2 Energy Constraint

South Africa faces major energy constraints, with the country's energy operating reserve margin i.e., the amount of electric generation resources planned to be available in the electricity generation system, as compared to the system's expected maximum demand for the year, of currently between 0%-5%. Internationally, reserve margin requirements are usually kept at about 15% of total demand. To ensure that South Africa's economy can continue to grow, the energy constraint can be addressed by constructing additional electricity generators.

WEF's in particular have a relatively short construction period when compared to other conventional generation technologies of the same scale, meaning that much-needed power can be added to the grid from WEF's in the short term.

2.7.3 Diversification and Decentralisation of Supply

With its abundant coal supplies, approximately 92.6% of South Africa's energy needs are currently met through coal-fired generators, with nuclear energy contributing 5.7% and the balance by pumped storage (1.2%), hydroelectric (0.5%) and gas turbines (0.1%). Electricity generation is dominated by state-owned power company Eskom, which currently produces over 96.7% of the power used in the country.[26]

A diversification of energy supplies, particularly with respect to renewable energy sources, would lead to greater energy security and economic and environmental benefits.

The deployment of various renewable technologies increases the diversity of electricity sources and, through local decentralised generation, contributes to the flexibility of the system and its resistance to central shocks.

According to the International Energy Agency, "*renewable energy resources … exist virtually everywhere, in contrast to other energy sources, which are concentrated in a limited number of countries. Reduced energy intensity, as well as geographical and technological diversification of energy sources, would result in far-reaching energy security and economic benefits.*"[27]

Progress in this regard has been made under the DoE REIPPPP (Section 3.2), with 64 approved wind, solar, small hydro and bioenergy projects at various stages of

[23] National TreasuryCarbon Tax Policy Paper. Available online http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf (Accessed 19th June 2014)
[24] http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf (accessed 18th June 2014)
[25] Copenhagen Accord https://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php (Accessed 20th June 2014).
[26] http://www.usea.org/sites/default/files/event-file/497/South_Africa_Country_Presentation.pdf (accessed 18th June 2014)
[27] www.iea.org/textbase/npsum/ETP2012SUM.pdf (accessed 18th June 2014)

development in the first three bidding windows of the REIPPPP, including 1,984 MW of wind power. According to the DoE's Integrated Resource Plan for Electricity 2010-2030, South Africa is aiming to procure 9,200 MW of wind power by 2030. Further information on the REIPPPP and the Integrated Resource Plan are presented in Section 3.2 this Draft Scoping Report.

2.7.4 Cost

In terms of cost, wind energy is globally one of the cheapest forms of new generation capacity available[28]. Under the REIPPPP, the fully-indexed tariffs for wind energy projects have dropped from R1.15/kilowatt hour (kWh) to as low as 66.4c/kWh, representing globally very competitive prices for energy generation. With Eskom currently producing power at 60c/kWh and with electricity from the coal-fired power stations currently under construction expected to cost more than 97c/kWh, wind energy is one of the lowest cost forms of new generation capacity in South Africa.

In addition to the levelised cost of developing, financing, constructing, operating and decommissioning energy generating facilities, all energy generators produce an external cost (or externality) such as the additional indirect costs incurred by society and the environment, including health, climate change, environmental, mining and water costs.

WEFs produce relatively small external costs when compared to other energy generation technologies.

2.7.5 Economic development

The REIPPPP requires economic development commitments from onshore wind energy projects. The main economic development beneficiaries of approved projects are currently communities living within a 50 km radius of renewable energy facilities.

WEFs in South Africa will create skilled and unskilled jobs, particularly during the construction period. Under the REIPPP, projects are incentivised to maximise the 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.

The surrounding communities of successful projects under the REIPPPP are required to have an equity stake in the project, which are either funded by financier or by the other equity partners. Community ownership of an operating WEF is generally conducted via a broad-based community trust, with the surrounding communities as beneficiaries of the

[28] https://about.bnef.com/press-releases/renewable-energy-now-cheaper-than-new-fossil-fuels-in-australia/
http://www.bloomberg.com/news/2013-02-06/australia-wind-energy-cheaper-than-coal-natural-gas-bnef-says.html
http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

dividends paid to shareholders in the project company. The dividend revenue will be invested in community development initiatives as outlined in the community trust deeds. In this way, successful REIPPPP projects are required to invest a percentage of gross revenue in socio economic development and enterprise development, primarily in the surrounding communities but in some cases beyond a 50 km radius of the project. A number of critical infrastructure and social programmes could be developed to support and enrich the areas in which the wind facilities are installed.

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

2.8 Consideration of Alternatives

Alternatives are different means of meeting the general purpose and need of a Proposed Development and may include alternative sites, alternative layouts/designs, alternative technologies and/or the no development alternative.

Section 2.7 above has provide an introduction for the Need for the Development, including a explanation as to why wind energy can be considered in some regards, as a preferential alternative of meeting the need for increased electricity demand over other source of generation such as fossil fuel. This includes:

- Climate change;
- Energy constraint;
- Diversification and decentralisation of supply;
- Costs; and
- Economic development.

Section 2.7 therefore demonstrates why wind energy can be considered a preferential alternative in terms of electricity generation. The following section considers the alternatives in relation to the Proposed Development site specifically.

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 alternative as a baseline scenario;
- A comparison of reasonable and feasible selected alternatives; and
- The provision of reasons for the elimination of an alternative.

2.8.1 The No Development Scenario

The No Development 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 implications of the No Development scenario include:

- The land-use remains agricultural with no further benefits derived from the implementation of a complementary land use;
- There is no change in the current landscape or environmental baseline;
- Whilst no WEF development will occur on site, other wind energy projects go ahead as planned for other areas locally;

- No additional electricity will be generated onsite or supplied through means of renewable energy resources. This would have implications for the South African Government in achieving its proposed renewable energy target;
- There is no opportunity for additional employment (albeit temporary) in the local area where job creation is identified as a key priority; and
- The local economic benefits associated with the Proposed Project's REIPPPP commitments will not be realised.

South Africa, like many nations in the world, faces serious electricity and water shortages due to its heavy dependency on fossil fuels and increase in demand. There is therefore a strong need for additional electricity generation options to be developed.

The purpose of the Proposed Development is to generate renewable electricity and export this to the National Grid. Many 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. In addition burning fossil fuels produces emissions of sulphurous and nitrous oxides 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 almost no water during operation. As a water stressed country South Africa should be conserving such resources wherever possible;
- Improved energy security – renewables can often be deployed in a decentralised way close to consumers improving grid strength while reduce expensive transmission and distribution losses. They also contribute to a diverse energy portfolio;
- Exploit significant natural renewable energy resources – biomass, solar and wind resources remain largely unexploited;
- Sustainable energy solution – The uptake of renewable energy technology addresses the country's energy needs in a sustainable manner, generating electricity to meet growing demands in a manner which is sustainable for future generations.
- Employment creation and other local economic benefits associated with support for a new industry in the South African economy.

The 'No Development' alternative will not assist the government in addressing climate change, nor will it assist in supplying the increasing electricity demand within the country.

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. As such, the 'No Development' alternative is not a preferred alternative.

2.8.2 Site Selection

WDSA have, and continue to undertake site selection exercises to find suitable wind energy sites across South Africa. Key criteria are considered including:

- Wind resource;
- Proximity to and availability of connections into the existing National Grid;
- Land availability;
- Site access and technical construction issues; and
- Initial environmental considerations.

The first stage is to identify a 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 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 Authorization through the EIA process. The wind energy resource is location specific to the Umsinde Emoyeni site.

The Proposed Development site was deemed to be suitable and was selected through this process based on anticipated wind resource (high wind speeds), proximity to existing grid infrastructure, land availability and minimum technical constraints from a construction perspective.

Further onsite wind monitoring is currently underway from several 80 m anemometer masts in order to confirm the wind resource on site and inform the turbine selection process and WEF layout.

No alternative sites are considered as the Proposed Development has been selected and alternative sites reviewed were deemed to be unsuitable for wind energy development.

2.8.3 Design Evolution Alternatives

The purpose of a WEF is to harness energy from the wind. It is important that wind turbines are sited in the optimum position to maximise the wind energy yield whilst minimising environmental impacts.

The optimum layout of a WEF depends on a range of criteria as noted in Section 2.5 above.

Information collated at the scoping stage will used to inform the design of the WEF progressively. Good practice advises that the EIA should be an iterative process rather than a unique, post design environmental appraisal. In this way the findings of the technical environmental studies are used to inform the design of a development.

This approach will be adopted in respect of the Proposed Development; where potentially significant impacts are identified, efforts will be made to avoid these through evolving the design of the Proposed Development. This will be referred to within this EIA report as mitigation embedded in the layout and design of the Proposed Development, or simply 'embedded mitigation'.

2.8.4 Technology Alternatives

Based on the site characteristics, the site is best suited for the harnessing of wind energy. The local topography is less suited to the construction of large scale ground mounted solar park, which would also require an extensive footprint to generate the equivalent energy of the proposed WEF.

Various wind turbine designs and layouts will be considered for the site in order to maximise the electricity generating capacity and efficiency. The turbine manufacturer and turbine model has not yet been determined and will not be decided until the completion of further wind analysis and competitive tendering.

3 REVIEW OF POLICY

3.1 Introduction

The following section provides a review of policy and planning documentation at a national, provincial and municipal level relevant to the Proposed Development. This section has been prepared by Arcus in conjunction with Tony Barbour Environmental Consulting. Through this documentation, 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.

The mechanism for the development of renewable energy facilities, by independent power producers in South Africa is the REIPPPP.

3.2 Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)

The REIPPPP was introduced in Section 2.7.3 of this Draft Scoping Report in relation to the Need for the Development. The REIPPPP is the mechanism which the DoE has provided for Independent Power Producers (IPPs), that is private companies, to develop, construct and operate renewable energy facilities in South Africa. Renewable energy in terms of the REIPPPP includes projects making use of any onshore wind, solar thermal, solar photovoltaic, biomass, biogas, landfill gas, or small hydro technologies.

The REIPPPP is essentially a selection process whereby the DoE evaluates potential renewable energy developments proposed by the IPP's through a competitive bidding process.

The bid is first evaluated to confirm it is compliant with the bidding requirements. This includes having completed the EIA and received an Environmental Authorisation from the competent authority. Compliant bids are then evaluated against the two main criteria: price of electricity from the project and its economic development commitments.

In terms of the project's economic development commitments, bidders must demonstrate how a project would contribute towards elements such as job creation, local content and local manufacturing, rural development and community involvement, education and development of skills, enterprise development, socio-economic development and participation by historically disadvantaged individuals (HDIs). Reporting to demonstrate compliance with commitments made by the project over the life of the project is a strict requirement of the REIPPPP.

The most competitive compliant projects are awarded "Preferred Bidder Status" based on 70/30 split between the price and project's economic development commitments.

If awarded Preferred Bidder Status, the IPP would enter into an implementation agreement with the DoE and a Power Purchase Agreement (PPA) with the buyer of the energy, which is in the majority of cases Eskom. Once operational the electricity would be sold to Eskom under the PPA at the agreed bid price. Eskom then distribute the energy through the National Grid to the energy users.

Initially the DoE announced that a total of 3,725 MW of power generation had been allocated to renewable energy generation through the REIPPPP, of which 1,850 MW of this was allocated specifically to wind energy projects. A further 3,200 MW of renewable energy generation including 1,470 MW of wind energy was allocated to the REIPPPP by a ministerial determination in December 2012. DoE has indicated that it is anticipated that the Minister will continue to make further allocations for renewable energy, allowing for an annual bidding process to be rolled out over coming years.

Bidding projects through the REIPPPP takes place during set bidding "rounds" or "bid windows". As of June 2014, three bidding rounds have been completed and have allocated a total of 1,984 MW of electricity generation from wind energy facilities.

The Proposed Development is intended to be submitted in Round 4 or Round 5 of the REIPPPP bidding process.

3.3 Policy Review

The following policy and planning documents were reviewed:

- The National Energy Act (2008)[29];
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)[30];
- The White Paper on Renewable Energy (November 2003)[31];
- Integrated Resource Plan (IRP) for South Africa (2010-2030)[32];
- The National Development Plan (2011)[33];
- New Growth Path Framework (2010)[34];
- National Infrastructure Plan (2012)[35];
- Climate Change Strategy and Action Plan for the Western Cape (2008)[36];
- White Paper on Sustainable Energy for the Western Cape (Final Draft, 2008)[37];
- Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape. Towards a Regional Methodology for Wind Energy Site Selection (2006)[38];
- The Western Cape Provincial Spatial Development Framework (2009)[39];
- Guideline for the Management of Development on Mountains, Hills and Ridges in the Western Cape (2002)[40];

[29] National Energy Act. Available online: http://www.energy.gov.za/files/policies/NationalEnergyAct_34of2008.pdf Accessed 17/06/2014

[30] Department of Minerals and Energy, 1998. White Paper on the Energy Policy of the Republic of South Africa. Available online: http://www.energy.gov.za/files/esources/petroleum/wp_energy_policy_1998.pdf Accessed 17/06/2014

[31] Department of Minerals and Energy, 2003. White Paper on Renewable Energy. Available online: http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup1_south_africa.pdf Accessed 17/06/2014

[32] Department of Energy. Integrated Resource Plan (IRP) for South Africa (2010-2030). Available online: http://www.doe-irp.co.za/ Accessed 17/06/2014.

[33] National Planning Commission. National Development Plan – Vision for 2030. Available online: http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf Accessed 17/06/2014.

[34] Economic Development Department. The New Growth Path Framework. Available online: http://www.economic.gov.za/communications/51-publications/151-the-new-growth-path-framework Accessed 17/06/2014.

[35] National Infrastructure Plan. Available online: http://www.gov.za/issues/national-infrastructure-plan/ Accessed 17/06/2014.

[36] Department of Environmental Affairs and Development Planning, Western Cape, 2008. A Climate Change Strategy and Action Plan for the Western Cape. Available online: http://www.westerncape.gov.za/text/2009/2/climate_change_strategy_and_action_plan_summary_dec08.pdf Accessed 17/06/2014.

[37] Department of Environmental Affairs and Development Planning: Western Cape. White Paper on Sustainable Energy for the Western Cape Province, 2008. Available online: http://www.westerncape.gov.za/text/2010/7/white_paper_-_sustainable_energy_western_cape.pdf Accessed 17/06/2014.

[38] Department of Environmental Affairs and Development Planning: Western Cape. Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape. Available online: http://www.westerncape.gov.za/general-publication/strategic-initiative-introduce-commercial-land-based-wind-energy-development Accessed 17/06/2014.

[39] Department of Environmental Affairs and Development Planning: Western Cape. Western Cape Provincial Spatial Development Framework. Available online: http://www.westerncape.gov.za/general-publication/western-cape-provincial-spatial-development-framework-psdf Accessed 17/06/2014.

[40] Western Cape Department of Environment and Cultural Affairs and Sport, 2002. Guideline for the Management of Development on Mountains, Hills and Ridges in the Western Cape. Available online: http://www.westerncape.gov.za/text/2003/mountain_hills_and_ridges_guideline.pdf Accessed 17/06/2014.

- Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities (2011)[41];
- Northern Cape Province Growth and Development Strategy (2004-2014)[42];
- Northern Cape Climate Change Response Strategy (in progress);
- Northern Cape Spatial Development Framework (2012)[43];
- Central Karoo District Municipality Integrated Development Plan (2012-2017)[44];
- Beaufort West Local Municipality Integrated Development Plan (2012-2017)[45]; and
- International Finance Corporation (IFC) Equator Principles (2013)[46].

A small section of the Proposed Development Site is located in the Ubuntu Local Municipality within the Northern Cape Province. However, the majority of the site is located within the Beaufort West Local Municipality (BWLM), which is one of three local municipalities that make up the Central Karoo District Municipality (CKDM) in the Western Cape Province. The focus of overview of the local level policy and planning environment is therefore on the BWLM and CKDM.

3.4 National Level Energy Policy

3.4.1 National Energy Act (Act No 34 of 2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble).

3.4.2 White Paper on the Energy Policy of the Republic of South Africa

Investment in renewable energy initiatives, such as the Proposed Development, is supported by the White Paper on Energy Policy for South Africa (December, 1998). In this regard the document notes:

"Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that

[41] Province of the Western Cape (2011). *Provincial Gazette 6894, Friday 29 July 2011;* PN 189/2011 (pp. 1381-6).
[42] Northern Cape Province Growth and Development Strategy (2004-2014). Available online: http://www.francesbaard.gov.za/documents/2011/NCPGDS%20FINAL.pdf Accessed 17/06/2014.
[43] Northern Cape Provincial Spatial Development Framework. Available online: http://northerncapepsdf.co.za/ Accessed 17/06/2014.
[44] Central Karoo District Municipality – 3rd Generation Integrated Development Plan 2012-2017. Available online: http://www.westerncape.gov.za/text/2012/11/central-karoo-dm-idp-2012-2017.pdf Accessed 17/06/2014.
[45] Beaufort West Local Municipality – Integrated Development Plan 2012-2017. Available online: http://www.beaufortwestmun.co.za/notices/IDP%20-%20BWM%20-%202012-2017%20FINAL.pdf Accessed 17/06/2014.
[46] Equator Principles (2013) Available online http://www.equator-principles.com/resources/equator_principles_III.pdf (Accessed 24th June 2014).

renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- Addressing constraints on the development of the renewable energy industry.

The White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive and many appropriate applications exist.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered. Advantages include:

- Minimal environmental impacts in operation in comparison with traditional electricity supply technologies; and
- Generally lower running costs, and high labour intensities.

The IRP 2010 also allocates 43% of new energy generation facilities in South Africa to renewables.

3.4.3 White Paper on Renewable Energy

This White Paper on Renewable Energy (November, 2003) (further referred to as the White Paper) supplements the *White Paper on Energy Policy*, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

As signatory to the Kyoto Protocol[47], Government is determined to make good the country's commitment to reducing greenhouse gas emissions. To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

South Africa is also a signatory of the Copenhagen Accord, a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change agreed to "take note of" at the final plenary on 18 December 2009. The accord endorses the continuation of the Kyoto Protocol and confirms that climate change is one of the greatest challenges facing the world. In terms of the accord South Africa pledged to ensure that the country's greenhouse gas emissions would be reduced from the business-as-usual growth trajectory by around 34 per cent by 2020 and 42 per cent by 2025.

Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

The Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-

[47] The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."[The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of November 2009, 187 states have signed and ratified the protocol (Wikipedia)

subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is:

"10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW)" (Executive Summary, ix).

3.4.4 National Integrated Resource Plan (IRP) for Electricity (2010-2030)

The Integrated Resource Plan (IRP) for South Africa, outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030.

In addition to all existing and committed power plants (including 10 GW committed coal), the Policy-Adjusted IRP includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables; and 8.9 GW of other generation sources.

Of the 17.8 GW allocated to renewables, 9.2 GW was allocated to wind power generation capacity by 2030.

The key conclusions that are relevant to the renewable energy sector include an accelerated roll-out of renewable energy options should be allowed in order to derive the benefits of localisation in these technologies.

The IRP is currently undergoing a periodic update process; public consultation on the proposed updates has been completed but the updates have not yet been finalised.

3.4.5 National Development Plan (NDP)

The National Planning Commission was tasked with outlining a developmental growth vision and plan for the country during the course of 2011. The NDP contains a plan aimed at eliminating poverty and reducing inequality by 2030, and provides that such should be the guiding objectives of the NDP over the next 20 years.

The NDP identifies 9 key challenges and associated remedial plans. While all nine challenges/ plans are envisaged as part of integrated whole, the highest priorities are regarded employment creation and improving the quality of national education. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

3.4.6 The New Growth Path Framework

A South African Government team, on 23 November 2010 released the Framework of the New Economic Growth Path aimed at enhancing growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years. It identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy.

In this regard the framework identifies investments in five key areas namely: ***energy***, transport, communication, water and housing.

The New Growth Path also identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector. The Green Economy is one of the five priority areas, including expansions in construction and the production of technologies for solar, wind and biofuels is supported by the draft

Energy on Integrated Resource Plan. In this regard clean manufacturing and environmental services are projected to create 300,000 jobs over the next decade.

3.4.7 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs, and strengthen the delivery of basic services. Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure through the plan.

These investments will improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification, and contribute to economic growth through investment in the construction of ports, roads, railway systems, ***electricity plants***, hospitals, schools and dams.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee has identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces.

The three energy SIPS are SIP 8, 9 and 10. SIP 8 and 9 are applicable to the WEF components, and SIP 10 to the grid components, of the Proposed Development.

3.4.7.1 SIP 8: Green Energy in Support of the South African Economy

SIP 8 includes the following aims:

- Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP2010); and
- Support bio-fuel production facilities.

3.4.7.2 SIP 9: Electricity Generation to Support Socio-Economic Development

SIP 9 includes the following aims:

- Accelerate the construction of new electricity generation capacity in accordance with the IRP2010 to meet the needs of the economy and address historical imbalances; and
- Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

3.4.7.3 SIP 10: Electricity Transmission and Distribution for All

SIP 10 includes the following aims:

- Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development; and
- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

3.5 Provincial Level Policy and Planning

3.5.1 Climate Change Strategy and Action Plan for the Western Cape

The Climate Change Strategy and Action Plan (Final Draft, December 2008) was commissioned by DEADP. The document is aligned with the Western Cape Sustainable Development Strategy, and gives expression to Provincial Government of the Western

Cape's (PGWC) acknowledgement that the province will inevitably be affected by climate change, and thus needs to timeously set in place a sound foundation for future climate change responses in the province.

The document consists of two sections. The first section examines climate change and socio-economic factors in the Western Cape, and establishes the need for a climate change response in the region. The second section outlines the key aspects of the Western Cape's response strategy.

Key points of specific relevance to the Proposed Development include the need for a climate change response in the Western Cape and a response strategy and action plan, as summarised below.

3.5.1.1 The Need for a Climate Change Response in the Western Cape

The Climate Change Strategy stated South Africa to be ranked as the 19th greatest emitter of greenhouse gasses (absolute terms) in the world however recent estimates indicate South Africa is now ranked as the 14th largest emitter[48].

While the Western Cape's local direct emissions are relatively low, this is largely the result of the province importing most of its electricity (~90%), mainly from coal fired stations such as Mpumalanga. While the social costs (air quality, health, land use, etc.) are largely transferred to coal mining and burning areas in the north of the country, it also means great losses in transmission efficiency (e.g., line losses) over the long distance from generation.

The Western Cape is very likely to experience the effects of human-induced climate change in the near future, possibly as early as 2030. Current predictions indicate that the Western Cape will generally become hotter and drier. Predictions indicate a mean increase in temperature of at least 1°C by 2050. Higher mean temperatures will have negative consequences for rainfall (frequency, amount) as well as the soil's ability to retain moisture. Periods of drought are anticipated to become more frequent and intense. Drier, hotter conditions will also increase the risk of more frequent, more severe fires.

Predicted hotter and drier conditions hold significant risks to the Province's key economic sectors and associated livelihoods. Compromised growing conditions and less water available for irrigation will negatively affect the agricultural sector – with massive negative implications for the regional economy, employment as well as regional food security. Increased sea surface temperatures will likely impact negatively on fish stocks. The tourism sector is likely to suffer from changes in the landscape amenity.

Export markets in the European Union are already starting to impose carbon emission reduction targets on their suppliers. The Western Cape, whose important agricultural sector is to a large extent export-orientated (wine and fruit) stands to lose market share on agricultural goods, for example, if no attempt is to be made to achieve at least carbon neutrality (no net emission of carbon for a produced good).

3.5.1.2 The Response Strategy and Action Plan

The Province's response strategy and associated action plan is based on two approaches, namely adaptation and mitigation.

[48] More recent estimates by the *Green Jobs* authors, based on 2011 International Energy Agency data, indicates that South Africa is in fact currently the 14th largest emitter of greenhouse gasses. Per capita, South Africa emits an estimated 7.49 t/capita/ year - surpassed by only a few countries, viz. the USA (16.90 t/c/a) and Russia (10.8), but surpassing the EU (7.15), China (5.14) and India (1.37). The South African economy is also one of least greenhouse efficient economies in the world, generating 0.7 kg / US$ GDP produced – compared to other large greenhouse gas emitters Russia (1 kg/ US$), China (0.55), the USA (0.46), India (0.35) the EU (0.3) and Brazil (0.2) (IDC, DBSA, TIPS, 2011: 13).

Four programmes are prioritised. Of specific significance to the development of renewable energy resources, the reduction of the province's carbon footprint is identified as the key mitigatory response. Associated strategies include promotion of energy efficiency (including demand management), the development of renewable and alternate sustainable energy resources, effective waste management strategies, and cleaner fuel programmes for households and transport.

Solar and wind energy are identified as the most suitable renewable technologies for the Western Cape. No development targets are set, and no specific suitable areas are identified.

3.5.2 White Paper on Sustainable Energy for the Western Cape

The White Paper on Sustainable Energy (2008) complements the Climate Change Strategy and Action Plan, specifically by setting targets for renewable energy generation.

The White Paper forms part of the Provincial Government of the Western Cape's (PGWC's) strategy to aimed at removing a number of barriers to the adoption and commercialisation of clean energy technologies and initiatives (including electricity generation from renewable sources such as wind and solar). The White Paper notes that, with regard to sources of renewable energy, wind and solar both represent commercially viable options in the province. The document proposes that special focus should be given to these renewables subsectors and specific associated technologies in particular in order to achieve critical mass of installation, and thus drive down establishment costs and ensure permanent employment opportunities.

3.5.3 Western Cape Draft Strategic Plan

In 2010 the PGWC adopted its own set of 12 Strategic Objectives as part of its Strategic Plan for the Western Cape[49].

Strategic Outcomes linked to economic, social and environmental sustainability (viz. 1-5; 7) of relevance to the Proposed Development include:

- (1) Increasing opportunities for growth and jobs; and
- (7) Mainstreaming sustainability and optimising resource use and efficiency.

Key environmental sustainability findings relating to resource use, greenhouse gas emissions and the specific role of transport in the province, include the following:

- Climate change constitutes one of the biggest medium-long term challenges facing local communities. Its effect on the province's natural resources, namely land, water, air, soil and biodiversity, as well as ecosystem goods and services, is likely to have a major impact on vulnerable economic sectors such as agriculture and communities (especially the poor communities) within the province; and
- At the time of publication approximately 95% of the energy currently used in the province is generated by the burning of non-renewable, greenhouse-effect enhancing fossil fuels (coal and oil). The document notes that this is completely non-sustainable for a number of reasons, including long term resource security (linked, amongst others, to Eskom's capacity and infrastructure), as well as emissions associated with the generation of the electricity.

Key environmental action plans and targets which have a potential bearing on the Proposed Development include:

[49] PGWC: Department of the Premier (2010). Delivering the Open Opportunity Society for All. Western Cape Draft Strategic Plan.

- An overall reduction of the current gross provincial product (GPP) to carbon emission ratio by 10% by 2014 is proposed.

With regard to combating climate change and greenhouse emissions, six focus areas are outlined in the WCDSP. Of these, the proposed Renewable Energy Programme is of specific relevance. Key aspects include the development of a provincial wind energy sector, energy production from alternative sources as well as net metering supported by a small-scale feed-in tariff to encourage small-scale renewable energy production (WCDSP, 2010: 47).

3.5.4 Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities

Amendments to the Western Cape Land Use Ordinance (1985) (LUPO) have been promulgated in order to guide the development of commercial renewable energy generation facilities (REFs), mainly wind and solar[50]. These Zoning Scheme amendments are specifically intended to provide guidance with regard to land use compatibility, and applicable development restrictions and conditions, including provision for mandatory rehabilitation post construction and final decommissioning ("abandonment" in terms of the Provincial Notice[51]). The ambit of the Regulations include all REFs as well as associated ("appurtenant") infra/ structure(s) operated for commercial gain, irrespective of whether such feed into the electricity grid or not. The section below provides an overview of key points of relevance to WEF proposals.

3.5.4.1 Zoning Status

- In terms of zoning status, "renewable energy structures" are designated as a consent use in the zone Agriculture I.

3.5.4.2 Land Use Restrictions

- Restrictions with regard to height are mainly applicable to wind energy facilities (WEFs), but associated on-site buildings for all REFs are limited to a maximum of 8.5 m (ground to highest point of roof).

3.5.4.3 Establishment of a Rehabilitation Fund

- Prior to authorisation, the applicant must make financial provision for the rehabilitation or management of negative environmental impacts, as well as of negative impacts associated with decommissioning or abandonment of the facility. Such provision should be in the form of a fund to be administrated by the Municipality, and should be to the satisfaction of the competent authority.

3.5.4.4 Land Clearing/ Erosion Management

- Land clearing should be limited to areas considered essential for the construction, operation and decommissioning of an REF;
- All land cleared during construction which does not form part of the REF structural footprint, must be rehabilitated in accordance with an approved rehabilitation plan; and
- Soil erosion must be avoided at all costs, and any high risk areas should be rehabilitated.

[50] Province of the Western Cape (2011). *Provincial Gazette 6894, Friday 29 July 2011;* PN 189/2011 (pp. 1381-6).
[51] "A Renewable energy structure shall be considered *abandoned* when the structure fails to continuously operate for more than one year" (§ 4(3) (m)).

3.5.4.5 Visual Impact Management

- Visual and environmental impacts must be taken into account, to the satisfaction of the competent authority;
- Associated structures (i.e. sub-stations, storage facilities, control buildings, etc.) must be screened from view by indigenous vegetation, and/or located underground, or be joined and clustered to avoid adverse visual impacts. In addition, appurtenant structures must be architecturally compatible with the receiving environment; and
- Lighting should be restricted to safety and operational purposes, must be appropriately screened from adjacent land units, and should also be in accordance with applicable Civil Aviation Authority requirements.

3.5.4.6 Operational Management and Maintenance

- REFs may not cause or give rise to any noise or pollution, deemed to be a nuisance in terms of applicable EIA Regulations or Municipal by-laws; and
- The REF owner/ operator is responsible for maintaining the REF in a good condition, including with regard to painting, structural repairs, ongoing rehabilitation measures (e.g., erosion), as well as the upkeep of safety and security measures.

3.5.4.7 Decommissioning Management

- An REF which has reached the end of its lifespan or that has been abandoned must be removed. The owner (operator) is responsible for the removal of such structures in whole, no longer than 150 days after the date of discontinued operation, and the land must be rehabilitated to the condition it was in prior to construction of the facility; and
- Decommissioning activities must include the removal of all REF structures, associated structures, as well as transmission lines; the disposal of solid and hazardous waste according to applicable waste disposal regulations; and the stabilization and re-vegetation of the site. In order to minimise disruptive impacts on vegetation, soils, etc., the competent authority may grant approval not to remove any underground foundations or landscaping.

In conclusion, it should be noted that the relevant provisions are mandatory (compliance requirements), and would therefore have to be implemented by the proponent.

3.5.5 Western Cape Provincial Spatial Development Framework

The Western Cape Provincial Spatial Development Framework ("PSDF") constitutes the fundamental policy instrument with regard to the spatial dimension of all development planning in the Western Cape. All lower order (i.e., district and municipal) spatial development policy documents (e.g., spatial development frameworks, spatial plans, land use determinations) need to conform the essential provisions of the PSDF[52].

The PSDF is underpinned by the fundamental assumption that development can only be acceptable and in the public interest if it is environmentally sustainable – that is ecologically justifiable, socially equitable as well as economically viable – and then in a hierarchical relationship, where economic efficiency (prosperity) is underpinned by social equity (human capital), which in turn is underpinned by ecological integrity (ecological capital – or health of ecological systems).

[52] In turn, the PSDF conforms to national spatial and developmental policy (i.e. the 2006 National Spatial Development Perspective) in all essential regards.

3.5.5.1 PSDF Objective 5: Conserve the Sense of Place of Important Landscapes

The PSDF notes the vital importance of tourism to the provincial economy. The PSDF therefore stipulates that, with regard to the siting and design of future power lines and other visibly substantial infrastructural development, the relevant provincial guidelines should be followed, and proposals should include provision for environmental, visual and heritage impact assessments. Directive HR27 further provides that *"Wind farms should be located where they will cause least visual impact, taking into consideration the viability of the project"* (Guiding directive).

3.5.5.2 Objective 9: Minimise Consumption of Scarce Environmental Resources

In line with national government's Climate Change Response Strategy, the PSDF makes provisions for a strategy based on demand management and the development of renewable resources. The PSDF proposes that 25% of the Province's energy generation should consist of renewables by 2020.

3.5.6 Western Cape Regional Methodology for Wind Energy Site Selection

The guideline document focuses specifically on the siting of WEFs. It is important to note that this guideline does not currently align with the strategic planning on renewable energy facilities from a national level, which focusses on identifying clusters of large renewable energy facilities. Whilst the content of these guidelines will be considered in the Proposed Development, they must be taken into context of the time of writing which was prior to the establishment of further knowledge gain from the experience of the growing renewable energy in South Africa, and resultant national level strategies.

Some of the findings and recommendations that have a bearing on the study are briefly summarised below.

3.5.6.1 Cumulative Impact Issues

The document recommends that:

- Large installations should be located extremely far apart (30 – 50 km); and
- Smaller installations should be encouraged in urban/ brownfield areas.

3.5.6.2 Recommended Disturbed Landscape Focus

In addition to proposing that smaller facilities should be focused in urban/ brownfield areas, the proposed methodology further recommends focusing on existing disturbed rural landscapes, and in particular, those rural landscapes that have already been "vertically compromised" by the location, for example, of transmission lines, railway lines, and phone towers.

3.5.6.3 Protecting Rural Landscape Values

The document notes that in Europe in the past, a great degree of emphasis was given to quantifying views from residential locations. This policy emphasis has effectively led to pushing WEF projects into more "remote" rural locations. The study notes that in the South African context this policy would effectively "penalise" rural areas, compromising wilderness and touristic visual values.

3.5.7 Guideline for the Management of Development on Mountains, Hills and Ridges in the Western Cape

The aim of the Guideline is to provide a decision-making framework with regard to developments which include listed activities in terms of NEMA Regulations, and which are proposed in an environment which is characterised by mountains, hills and ridges. The

key aspects reflected in the Guidelines that have a potential bearing on the Proposed Development are listed below.

The Guideline notes that mountains, hills and ridges are subject to a range of development pressures. A guiding framework is therefore needed to control development in these areas, as they may generally be characterised as environmentally sensitive. Key reasons listed are to:

- Provide catchment areas for valuable water resources;
- Often characterised by unique and sensitive ecosystems;
- Have aesthetic / scenic value; and
- Provide "wilderness" experience opportunities.

It should also be noted that the Guidelines were developed in 2002 and at the time did not take into account or consider the development of WEFs and the technical considerations, specifically wind conditions, that need to be considered when identifying potentially suitable sites for WEFs. This is an issue that the relevant environmental authorities need to take into account, specifically given the national and provincial energy policies that support the development of renewable energy projects, including WEFs.

3.5.8 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The NCPGDS make reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "*the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape*". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

3.5.9 Northern Cape Provincial Spatial Development Framework

Northern Cape Provincial Spatial Development Framework (NCSDF) (2012) lists a number of sectoral strategies and plans that are to be read and treated as key components of the PSDF.

Section C8.2.3, Energy Objectives, sets out the energy objectives for the Northern Cape Province. The section makes specific reference to renewable energy.

Section C8.3.3, Energy Policy, sets out the policy guidelines for the development of the energy sector, with specific reference to the renewable energy sector.

3.5.10 Northern Cape Climate Change Response Strategy

The strategy provides a commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including

green jobs, and environmental leadership is indented as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and **wind** energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.

3.6 Local Level Policy and Planning

3.6.1 Central Karoo District Municipality (CKDM) Integrated Development Plan (IDP)

The IDP identifies 8 Strategic Objectives which are aligned with the national key performance areas and the core functions of the municipality. The objective relevant to the Proposed Development is to pursue economic growth opportunities that will create descent work and seeks to be financial sustainable, maintain the rural character and create healthy communities by facilitating economic growth, improving infrastructure and the ***green energy*** opportunities, providing and supporting alternative modes of delivery (shared services), improve marketing, branding and communication with all stakeholders, provide excellent disaster and risk management services, and maintaining housing choices for a range of income levels.

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was undertaken as part of the IDP process. Of relevance to the proposed project the Green Energy and Regional Local Economic Development were identified as key opportunities. However, tourism was also identified as a key opportunity.

3.6.2 Central Karoo Spatial Development Framework (SDF)

The Central Karoo SDF indicates desired land-use patterns, addresses spatial reconstruction and provides guidance in respect of the location and nature of future development. The SDF adopts the vision and mission of the IDP and expresses it in a spatial sense. Beaufort West Local Municipality Integrated Development Plan (BWLM IDP)

The BWLM IDP (2012-2017) outlines the vision for the LM, which is "*Beaufort West, land of space in the Great Karoo, strives to improve the lives of all its residents by being a sustainable, expanding and safe town*".

The Key Performance Areas (KPAs) and Strategic Objectives listed in the IDP that are of relevance to the Proposed Development are:

Basic service delivery and infrastructure development:

- To improve and maintain current basic service delivery and infrastructure development through the provision of basic services and specific infrastructural development projects;
- To collaborate with other government departments in the province and nationally to respond to the current needs in the community regarding water, sanitation, housing, roads and sport and recreation; and
- To develop a local economic development strategy that responds to food security, social infrastructure, health environment, education and skills development and the gender balances in society.

To foster intergovernmental relations nationally and provincially through the design and delivery of projects that will make a significant impact in the life of citizens:

- The development of a LED strategy with the prime focus on job creation – both skilled and sustainable jobs, short-term jobs and jobs as part of the expanded public works programme;

- To work with relevant stakeholders to develop a strategy to harness and expand the current potential for income generation via tourism;
- To develop mechanisms and processes where communities become aware of the pivotal role that they play in their own development;
- To harness the natural resources of the municipal area and collaborate with other organs of state, nongovernment organisations, business and other relevant stakeholders to respond to the environmental challenges and how the environment can be used to contribute to social and economic development; and
- Explore one big project to generate income directly for the municipality.

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was undertaken as part of the IDP process. The opportunities identified that are relevant to the Proposed Development include:

- National strategic transport hub;
- Best lamb and sheep farming climate and conditions;
- Ideal hunting and tourism environment and climatic conditions;
- Uranium mining and fracking;
- International and national tourism and commercial link between Gauteng, Western Cape, KZN, Northern Cape, Eastern Cape and Namibia;
- Wind farming and renewable energy;
- Hydroponics and olive farming; and
- CKDM LED agency.

3.6.3 Beaufort West Local Municipality (BWLM) Local Economic Development Plan

The IDP summarises the key components of the BWLM Local Economic Development (LED) Plan. The purpose of the LED policy, strategy and related plans focuses on the need to coordinate and integrate economic development efforts, resources, role players, investments and institutions (internally and externally).

The IDP lists the LED Plans Strategic Objectives. Strategy 1, Basic service delivery and infrastructure development and Strategy 4, to develop a local economic development strategy that responds to food security, social infrastructure, health environment, education and skills development and the gender balances in society, are of relevance to the Proposed Development.

3.7 International

3.7.1 International Finance Corporation (IFC) Equator Principles (2013)

The Equator Principles are a *risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making*[53].

Large scale infrastructure projects have the potential to result in adverse social and environmental impacts. The Equator Principles, as stated above, are guidelines adopted by financial institutions involved in the financing of such projects to ensure projects they invest in are developed in a responsible manner. The Equator Principles acknowledge that adverse impacts on ecosystems, communities and climate should be avoided where possible.

Stakeholder engagement is a key requirement of the Equator Principles including making project documentation available for public review. In relation to the Proposed

[53] Equator Principles available online at http://www.equator-principles.com/ (Accessed 24th June 2014).

Development the mechanisms for this are described in Section 1.2.6 of this Draft Scoping Report and Appendix 1.1.

The Equator Principles require that an "assessment " is taken place to address relevant environmental and social risks, and include measures to minimise, mitigate and offset adverse impacts. This assessment process should comply with the legislative requirements of the Republic of South Africa in relation to the Proposed Development, and also the applicable IFC Performance Standards. A list of the Performance Standard is provided below:

1. Assessment and Management of Environmental and Social Risks and Impacts;
2. Labour and Working Conditions;
3. Resource Efficiency and Pollution Prevention;
4. Community Health, Safety and Security;
5. Land Acquisition and Involuntary Resettlement;
6. Biodiversity Conservation and Sustainable Management of Living Natural Resources;
7. Indigenous Peoples; and
8. Cultural Heritage.

DRAFT SCOPING REPORT

COMBINED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 1 & 2 AND ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 & 2 WESTERN CAPE & NORTHERN CAPE

Environmental Baseline and Methods for the EIA

Chapter 4: Visual Impact
Chapter 5: Terrestrial Ecology
Chapter 6: Bats
Chapter 7: Wetlands and Freshwater
Chapter 8: Avifauna
Chapter 9: Soils and Agriculture
Chapter 10: Cultural Heritage, Archaeology and Palaeontology
Chapter 11: Noise
Chapter 12: Social

4 VISUAL IMPACT ASSESSMENT

4.1 Introduction

The following specialists were commissioned to produce the Visual Impact Assessment:

- Bernard Oberholzer, Landscape Architect and Principal at BOLA; and
- Quinton Lawson, Architect and Partner at MLB Architects.

A Visual Baseline Study was conducted to inform the Draft Scoping Report, and is aimed at informing the layout of the Proposed Development.

4.2 Baseline Survey Methods

4.2.1 Survey Standards

In South Africa there are no explicit legal requirements for the preparation of a visual baseline study. However, the 'Guideline for Involving Visual and Aesthetic Specialists'[54], issued by the Provincial Government of the Western Cape, was used as guidance.

4.2.2 Study Area

The study area includes all land falling within the Proposed Development boundary and the immediately surrounding area, up to 15 km from the boundary, so as to include the viewsheds of the Proposed Development Site, as indicated in Figure 4.2 and 4.3.

4.2.3 Methodology

The following baseline methodology was employed:

- Mapping of the study area and its landscape context;
- Mapping of the projected viewsheds and distance radii of the Proposed Development to determine the possible zone of visual influence;
- Identification of important viewpoints and view corridors;
- A photographic survey from selected viewpoints, taking into account possible sensitive receptors;
- Identification of landscape characteristics, including topographical and geological features, vegetation cover, land use, cultural landscapes and cultivated lands, settlements and farmsteads;
- Identification and mapping of visual/ landscape constraints, including buffers, for the proposed WEF and grid connection infrastructure, with an indication of significance and overall sensitivity;
- Formulation of possible design considerations; mitigation measures and recommendations to minimise potential adverse visual impacts.

4.3 Baseline Environment

Relevant landscape features of the receiving environment include the following:

4.3.1 Location

The Proposed Development Site, which covers approximately 93,000 ha, is accessed via the R63 trunk road, which passes through the southern portion of the Proposed Development Site, and other unnamed/ unnumbered local gravel roads. Graaff-Reinet

[54] Oberholzer, B. 2005. Guideline for Involving Visual and Aesthetic Specialists in EIA Processes. Edition 1. CSIR Report No. ENV-S-C 2005 053 F. Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

and the Camdeboo National Park lie approximately 60 km to the southeast on the R63. The junction between the R63 and the N1 National Road is approximately 40 km northwest of Murraysburg. The Grid Connection Site boundary connects the WEF with the Eskom Gamma substation; it should be noted that this is the same study area proposed for the grid infrastructure associated with the proposed Ishwati Emoyeni WEF. If the adjacent Ishwati Emoyeni WEF is authorised and constructed in advance of Umsinde Emoyeni, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect Umsinde Emoyeni to the National Grid.

4.3.2 Geology

The geology of the area is characterised by the mudstones and sandstones of the Beaufort Group, creating a gently undulating to flat landscape which is typical of the Karoo. Dolerite dykes and sills exist, which intrude the Beaufort sedimentary formations, and are more resistant to erosion, creating the scenic ridges and koppies of the area, which in turn are more visually sensitive.

4.3.3 Physical Landscape

The topography is a reflection of the geology of the area, with flattish plains often interspersed by flat-topped dolerite koppies. The western portion of the Proposed Development Site is more low-lying, than the eastern side. The site ranges from 1200 m to 1900 m elevation with these higher areas being more exposed to wind, and at the same time more visually exposed.

The landscape is dissected by a number of seasonal rivers and tributaries.

4.3.4 Vegetation

The vegetation of the majority of the Proposed Development Site is classified as 'Eastern Upper Karoo', consisting of white grasses (*Aristida* and *Eragrostis*), interspersed with low hardy shrubs and succulents. The higher lying dolerite koppies are classified as 'Upper Karoo Hardeveld' with sparse dwarf Karoo scrub and drought-tolerant grasses[55]. Slightly taller thicket occurs along drainage courses where the vegetation is still intact. Exotic trees, including gums, poplars and pines have typically been planted around the farmsteads for shade and wind protection. The exotic copses and shelterbelts provide some visual screening for the farmsteads.

4.3.5 Land Use

The relatively low rainfall and sparse vegetation limits the agricultural potential to mainly extensive sheep grazing; the area being noted for Marino sheep wool and mohair, as well as 'Karoo lamb'. Lucerne is grown in alluvial valleys where irrigation is available.

The farms tend to be large in area in order to be viable for sheep farming, with farmsteads typically being between 5 and 10 km apart. Some of the farms provide guest accommodation, such as Ratelfontein to the north, which is a large game farm, Badsfontein to the west and Braankraal to the south west. Recreation/ tourism activities include hunting, horse-riding and "4x4" trails on some of the farms.

There are no National Parks or known nature reserves in the immediate surrounding areas. There are also no large settlements, and except for a short section of the R63, other gravel roads and farm dams, there is little infrastructure within the Proposed

[55] Mucina L. and Rutherford MC, (eds), 2006. The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. South African National Biodiversity Institute, Pretoria.

Development Site. The farming town of Murraysburg is located approximately 7 km to the southwest of the Proposed Development Site, and Richmond is approximately 30 km to the north.

No existing overhead power lines were visible from any of the viewpoints with the exception of low voltage lines serving the farms.

A small airfield is indicated on mapping at Vleiplaats, approximately 7 km east of Murraysburg on the R63, and another landing strip exists approximately 2 km south of Murraysburg.

4.4 Identification of Receptors

4.4.1 Landscape Receptors

The Proposed Development Site forms part of the Great Karoo, an area renowned for its wide open spaces, serenity, quiet and starry skies at night; qualities which attract both local and overseas visitors.

The dolerite koppies, scarps and rock outcrops are attractive scenic features and as such are considered to be visually sensitive. The Proposed Development Site notably lacks visual intrusions, such as manmade vertical and linear features, including masts and power lines.

As such the characteristic of the landscape is considered to present a sensitive receptor to the Proposed Development.

4.4.2 Visual Receptors

Visual receptors are receptors whom may be impacted upon by the Proposed Development by their ability to view it.

Sensitive visual receptors which need to be considered include:

- Murraysburg - an historic settlement with a number of noteworthy buildings;
- Commuters and visitors using the R63, an important arterial route linking Graaff-Reinet and Murraysburg with the N1 National Road, and the two gravel roads connecting the R63 with Richmond;
- Visitors to game farms and guest farms, such as Ratelfontein, Badsfontein and Brand-kraal; and
- Residents of Murraysberg and farms within the study area.

A high ridgeline exists outside the eastern boundary of the Proposed Development Site which would provide a physical visual barrier for the areas to the east of the Proposed Development. Other smaller ridges and koppies within the Proposed Development Site would also provide some visual screening.

4.5 Potential Impacts and Mitigation

4.5.1 Potential Impacts

The Proposed Development has the potential to cause visual impacts within the study area. The cause and nature of these potential impacts, along with the potential receptors is provided in Table 4.1 below.

Table 4.1: Potential Visual Impacts

Source	Pathway	Receptor
Up to 98 wind turbines (per phase) with a maximum tip	Potential visual intrusion of the wind turbines on the skyline as	Residents of Murraysburg and outlying farms;

Source	Pathway	Receptor
height of 180 m.	viewed by receptors.	Visitors to game farms and guest farms; Commuters and visitors on the R63 and district gravel roads; Landscape character of the Karoo including characteristic dolerite koppies and ridge features.
Other infrastructure including access tracks, substations and power lines.	Potential visual intrusion of the associated infrastructure creating an industrial landscape.	Residents of Murraysburg and outlying farms; Visitors to game farms and guest farms; Commuters and visitors on the R63 and district gravel roads; Landscape character of the Karoo.
The potential shadow flicker effect of the rotors in the early morning and evening when the sun is near the horizon.	Potential visual disturbance caused by the flicker-effect.	Residential receptors to the south of the turbines, typically within 10 rotor diameters of a turbine.
The potential effect of red aviation safety lights (if required) on top of the wind turbines at night.	The potential visual intrusion of the red lights on the Karoo night sky.	Residents and visitors within the view shed of the WEF.
The potential visual effect of activities during the construction and decommissioning phases of the Proposed Development such as the presence of cranes and construction machinery.	The potential intrusion of industrial machinery in the landscape	Residents of Murraysburg and outlying farms; Visitors to game farms and guest farms; Road users.

4.5.2 Potential Mitigation Measures

The siting of wind turbines during site design should make use of the visual screening effect of surrounding ridges and koppies as far as possible so as to reduce the impact on the receptors noted above.

The design will take into account visually sensitive skylines, such as peaks, major ridgelines, scarp edges and prominent elevations.

Whilst it is noted that the majority of the Proposed Development Site is of poor agricultural quality, used for extensive sheep grazing, any cultural landscapes or valuable cultivated land in terms of landscape will be considered in this assessment.

Setting back the design/layout of the Proposed Development, or screening of sensitive receptors, will be considered giving due regard to the Western Cape Provincial guidelines, and to site-specific indicators presented in Table 4.2 below. These set-backs do not represent constraints to the design at this stage as they must be taken into the context of the design and visibility from sensitive receptors.

Table 4.2: Set-back Distances for Wind Turbines

Landscape features/criteria	PGWC Guidelines
Proposed Development Site boundary	-
Perennial rivers, wetland features	500 m
Ridgelines, peaks and scarps	500 m
Local roads	500 m
Local roads (scenic)	review if scenic
R63 arterial route	review if scenic
Farmsteads (inside the Proposed Development Site)	400 m (noise)
Farmsteads (outside the Proposed Development Site)	400 m (noise)
Private nature reserves/ game farms/ guest farms/ resorts	500 m

The overhead power lines proposed for the grid connection should take into account similar considerations, although set-back distances would be reduced for the pylons as their height is considerable lower than the turbines used to produce the site specific set-backs above.

A further design consideration to introduce embedded mitigation would be, subject to other identified constraints.

With regards to mitigation measures for ancillary equipment the following techniques will be considered during the site design process:

- Substations should ideally be screened by the topography from sensitive receptors, and by tree-planting considered if possible;
- Operations and maintenance buildings and parking areas should also be located in an unobtrusive area and consolidated to avoid the sprawl of buildings in the open landscape; and
- Access tracks should be designed in sympathy with the grain of the landscape and the contours, in order to reduce the requirements for extensive cut and fill, and should avoid drainage courses as far as possible. The access tracks should be kept as narrow as possible and should be built using stone and material cohesive to the environment in which the Development is proposed. It is noted that wide access tracks (up to 9 m) are required during construction, in order to facilitate the safe delivery of abnormal turbine component loads, however the width of the access tracks can be reduced to between 3 m and 4 m during the operational phase of the Development.

4.6 Relevant Stakeholders/ Consultees

A number of consultees have been identified including:

- The owners of Ratelfontein game farm;
- The owners of Badsfontein guest farm;
- The owners of Braandkraal;
- Ratepayers' associations;
- Local farmers' associations; and
- Local tourism organisations covering this part of the Karoo.

The above will be consulted through the PPP and by means of interviews and focus group meetings if deemed necessary.

4.7 Assessment Methods

The visual assessment would be based on a number of quantitative and qualitative criteria to determine potential visual impacts, as well as their relative significance. The criteria are listed below.

4.7.1 Visibility

Visibility is determined by distance between the Proposed Development and the viewer. For the WEF the primary consideration is the wind turbines, as they will be the most visible due to their height. Distance radii are used to quantify visibility of the wind turbines, assuming turbines with a hub height of up to 120 m and a maximum height to tip of 180 m. It was also assumed turbines would be set-back from the WEF Site boundary by 270 m (1.5 times the maximum turbine height). The resultant viewshed is shown in Figure 4.2.

Figure 4.3 provides the viewsheds for the grid connection which assumes a maximum infrastructure height of 55 m, set-back 250 m from the Grid Connection Site Boundary. This is likely to be an over estimation of the height of the grid infrastructure however it is included at this stage as a worst case assumption.

General degrees of visibility are listed in Table 4.3, but may be subject to screening provided by foreground topography and trees and the number of turbines that are visible.

Table 4.3 General Degrees of Visibility

Visibility	Description	Distance
High Visibility	Prominent feature within the observer's viewframe	0 – 2.5 km
Mod-High Visibility	Relatively prominent within observer's viewframe	2.5 – 5 km
Moderate Visibility	Only prominent with clear visibility as part of the wider landscape	5 – 15 km
Marginal Visibility	Seen in very clear visibility as a minor element in the landscape	15 – 30 km

A review of the viewsheds was combined with the potential receptors identified in Section 4.4 to develop a list of viewpoints which will be considered in the visual impact assessment. The location of these viewpoints is shown in Figure 4.1.

The potential visibility of the Proposed Development from selected viewpoints is given in Table 4.4, and in the photographic panoramas provided in Figures 4.5.1 – 4.5.7.

Table 4.4: Potential Visibility from Viewpoints

Viewpoint (Figure 4.1)	Location	Coordinates	Approximate Distance	Visibility
VP1	R63 near Essex	32.0262S, 24.1343E	10.6 km	Moderate
VP2	R63 near Marino	32.0008S, 24.0994E	6.3 km	Moderate
VP3	R63 near Poortjie	31.9825S, 24.0600E	2.2 km	High
VP4	Regional road at Witteklip	31.9014S, 24.0702E	1.6 km	High
VP5	Rhenosterfontein	31.7482S, 24.0921E	4.8 km	Mod-high
VP6	Regional road at Avontuur	31.6701S, 24.0614E	6.8 km	Moderate

Viewpoint (Figure 4.1)	Location	Coordinates	Approximate Distance	Visibility
VP7	Philipskraal	31.7712S, 24.0484E	0.25 km	High
VP8	R63 at Vleiplaats	31.9818S, 23.8395E	4.9 km	Mod-high
VP9	Badsfontein gate	31.8016S, 23.7373E	4.7 km	Mod-high
VP10	Badsfontein opstal	31.7935S, 23.7433E	3.8 km	Mod-high
VP11	Badsfontein dam	31.7949S, 23.7455E	3.6 km	Mod-high
VP12	Elandspoort	31.6164S, 23.7734E	14.2 km	Marginal
VP13	Ratelfontein ridge	31.6162S, 23.6745E	20.7 km	Marginal
VP14	Ratelfontein east	31.6269S, 23.6833E	19.3 km	Marginal
VP15	Ratelfontein saddle	31.6262S, 23.6769E	19.9 km	Marginal
VP16	Rooisandheuwel	31.6885S, 23.7959E	6.7 km	Moderate
VP17	Snyderskraal	31.8500S, 23.7432E	7.4 km	Moderate
VP18	Brookfield	31.8882S, 23.7233E	11.4 km	Moderate
VP19	R63 Murraysburg town	31.9627S, 23.7711E	7.7 km	Moderate
VP20	R63 Brandkraal	31.9638S, 23.7406E	10.2 km	Moderate

4.7.2 Visual Exposure

Visual exposure, as illustrated in Figures 4.2 and 4.3, is determined by the viewshed. It is the geographic area within which the Proposed Development could be visible, with the boundary tending to follow ridgelines and high points in the landscape. Some areas within the viewshed fall within a view shadow, and would therefore not be affected by the wind turbines. As no indicative turbine layout is available at this stage, preliminary viewsheds have been prepared for the WEF and Grid Connection Site, although the viewshed for the final layout, as will be presented in the EIA report, would be smaller. It should also be noted the viewsheds only take into account topography and do not account for vegetation or buildings which may obscure views.

4.7.3 Visual Sensitivity

Visual sensitivity is determined by topographic features, steep slopes, rivers, scenic routes, cultural landscapes, and tourist facilities such as guest farms and game farms. These, together with the set-back distances proposed in Table 4.2, have been mapped to inform the layout of the WEF (Figure 4.4).

4.7.4 Landscape Integrity

Visual quality is enhanced by the scenic or rural quality and intactness of the landscape, as well as lack of other visual intrusions. The study area is at present generally intact with few visual intrusions, including manmade vertical and linear features.

4.7.5 Cultural Landscape

Besides natural attributes, landscapes have a cultural value, enhanced by the presence of heritage sites, historical settlements, farmsteads and cultivated lands. These would be informed by the heritage specialist study presented in Chapter 10 of this Draft Scoping Report.

4.7.6 Visual Absorption Capacity

This is the potential of the landscape to screen the Proposed Development. The study area encompasses a number of ridges and koppies, which will have a screening effect, but is otherwise relatively open and visually exposed.

4.7.7 Overall Visual Impact Significance

The criteria above will be considered in combination to give an indication of the nature and degree of the potential visual impacts, and are then assessed in terms of the EIA approach outlined in Section 1.2.5 to determine their overall significance of the Proposed Development.

4.7.8 Cumulative Visual Impact

In addition to the assessment of each of the components of the Proposed Development being assessed individually, the assessment will also consider the cumulative impact of the components if all constructed, and the cumulative impact with other similar developments, in particular proposed WEFs in the area.

Cumulative developments which will be considered include:

- Ishwati Emoyeni WEF (up to 80 turbines, 170 m to blade tip) which is proposed adjacent to the northwest of the Proposed Development Site and its associated infrastructure. It is however noted that if the Ishwati Emoyeni WEF is authorised and constructed in advance of the Proposed Development, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect the Umsinde Emoyeni WEF to the national grid, and thus reduce some of the visual impacts;
- The Noblesfontein WEF;
- Victoria West WEF; and
- The Modderfontein WEF.

In addition, consideration will be given to in combination impacts which may impact the aesthetic quality of the area such as noise.

5 TERRESTRIAL ECOLOGY (FLORA AND FAUNA)

5.1 Introduction

Anchor Environmental Consultants, working in collaboration with Simon Todd Consulting, were commissioned to provide the terrestrial ecological (Flora and Fauna) input for the EIA.

This Chapter of the Draft Scoping Report:

- Describes and detail the ecological features of the Proposed Development Site;
- Provides a preliminary assessment of the ecological sensitivity of the Proposed Development Site; and
- Identifies the likely impacts that may be associated with the Proposed Development.

A desktop review of the available ecological information for the area has been conducted in order to identify and characterise the ecological features of the Proposed Development Site.

5.2 Baseline Survey Methods

5.2.1 Data Sourcing and Review

Data sources from the literature consulted and used where necessary in the study are set out below.

5.2.1.1 Vegetation

- Vegetation types and their conservation status have been extracted from the South African National Vegetation Map (Mucina and Rutherford 2006)[56] as well as the National List of Threatened Ecosystems (2011)[57], where relevant.
- Critical Biodiversity Areas (CBA) mapping and systematic conservation planning information for the Central Karoo District Municipality, produced by Skowno et al. (2009)[58]. No CBA mapping or systematic conservation planning has been conducted for that part of the site which falls within the Northern Cape, with the result that no detailed conservation priority area information is available for that area.
- Information on plant and animal species recorded for the Quarter Degree Square (QDS) (QDS) 3123 DB, DD and 3124 CA and CC was extracted from the SABIF/SIBIS database hosted by SANBI[59]. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has probably not been well sampled in the past.
- The International Union for the Conservation of Nature (IUCN) conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2013)[60].
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011)[61].

[56] Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
[57] National List of Threatened Ecosystems. Available online http://bgis.sanbi.org/ecosystems/project.asp (Accessed 19th June 2014).
[58] Biodiversity Assessment of the Central Karoo District Municipality. Available online http://bgis.sanbi.org/ckdm/CKDM_BiodiversityAssessment.pdf (Accessed 19th June 2014).
[59] SIBIS:SABIF Integrated Biodiversity Information. Available online http://sibis.sanbi.org/ (Accessed 19th June 2014)
[60] IUCN 2013. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>.
[61] Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801

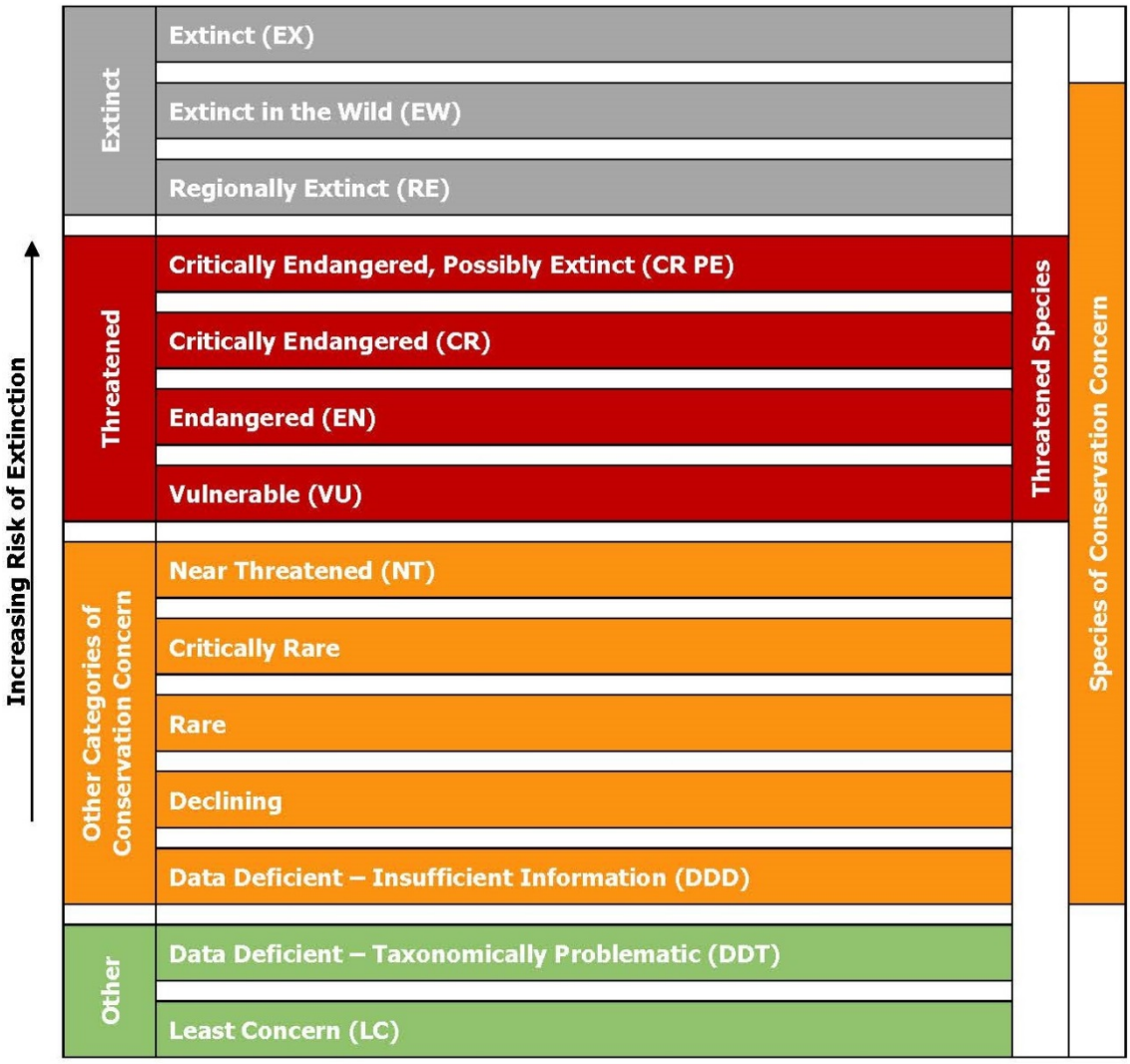
- Important catchments and protected areas' expansion areas have been extracted from the National Protected Areas Expansion Strategy,[62] 2008 (NPAES).

5.2.1.2 Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SIBIS/SABIF and BGIS databases[63]).
- Literature consulted includes Branch (1988)[64] and Alexander and Marais (2007)[65] for reptiles, Du Preez and Carruthers (2009)[66] for amphibians, Friedmann and Daly (2004)[67] and Skinner and Chimimba (2005)[68] for mammals.
- Apart from the literature sources detailed above, additional information on reptiles was extracted from the SARCA web portal, hosted by the ADU, http://vmus.adu.org.za. As most groups have been poorly sampled the sample area was expanded to include the whole degree squares 3123 and 3124.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the Proposed Development Site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2013) (Plate 5.1) and where species have not been assessed under these criteria, the Convention on International Trade in Endangered Species (CITES)[69] status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the Proposed Development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the Proposed Development Site were noted.

[62] National protected Area Expansion Strategy. Available online: http://bgis.sanbi.org/protectedareas/NPAESinfo.asp (Accessed 19th June 2014).
[63] Biodiversity GIS Database. Available online http://www.bgis.sanbi.org/index.asp?screenwidth=1600 (Accessed 19th June 2014).
[64] Branch W.R. 1998. Field guide to snakes and other reptiles of southern Africa. Struik, Cape Town.
[65] Alexander, G. & Marais, J. 2007. A Guide to the Reptiles of Southern Africa. Struik Nature, Cape Town.
[66] Du Preez, L. & Carruthers, V. 2009. A Complete Guide to the Frogs of Southern Africa. Struik Nature., Cape Town
[67] Friedmann.Y, & Daly.B, 2004. Red data book of the mammals of South Africa: a conservation assessment.
[68] Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge
[69] CITES species. Available online: http://www.cites.org/eng/disc/species.php (Accessed 19th June 2014).

Plate 5.1: Schematic representation of the South African Red List categories[70]



The above is reproduced from the South African National Biodiversity Institute (SANBI) Threatened Species and Species of Conservation Concern. Available online: http://redlist.sanbi.org/redcat.php. Accessed 17/06/2014.

5.2.2 Site Visit

The WEF Site has been visited for a high level screening study which has provided knowledge to validate the desktop information, as well as contribute additional insight into the ecological patterns and processes at the WEF Site.

The screening study site visit was conducted between the 3rd and 5th July 2013 and used to:

- Gain a broad understanding of the site, in terms of the distribution of vegetation and habitats;
- Understand the broad characteristics of the site;
- Focus on the areas likely to represent key areas for development at the site; and

[70] Available online: http://redlist.sanbi.org/redcat.php (accessed 6th June 2014)

- Characterise potentially sensitive areas that may need to be avoided.

Detailed species lists were not compiled at this point, as it would not contribute significantly to the study given the uncertainties over infrastructure location. It was considered more appropriate to investigate more generally a larger proportion of the WEF Site. However, where specialised or sensitive habitats were encountered, these were investigated for the presence of species of conservation concern, as their abundance and presence at the site would be important.

In addition, Simon Todd, the ecological specialist for the Proposed Development, performed the ecological assessment for the neighbouring Ishwati Emoyeni WEF which shares a development location which overlaps with the Grid Connection Site and hence has a good knowledge of the ecology in this locality.

5.3 Baseline Environment

5.3.1 The WEF Site

5.3.1.1 Broad-Scale Vegetation Types

According to the national vegetation map (Mucina & Rutherford 2006)[71], only three different vegetation types occur within the WEF Site: Upper Karoo Hardeveld, Eastern Upper Karoo and Southern Karoo Riviere (Figure 5.1).

The WEF Site is dominated by Eastern Upper Karoo, which at 49,821 km^2 is the most extensive vegetation type in South Africa and forms a large proportion of the central and eastern Nama Karoo Biome. This vegetation type is classified as Least Threatened, and about 2% of the original extent has been transformed largely for intensive agriculture. The vegetation type is however poorly protected and less than 1% of the 21% target has been formally conserved. Mucina & Rutherford (2006)[72] list eight endemic species for this vegetation type, which considering that it is the most extensive unit in the country, is not very high and may be considered to be an underestimate.

The Upper Karoo Hardeveld vegetation type is associated with 11,734 km^2 of the steep slopes of koppies, butts mesas and parts of the Great Escarpment covered with large boulders and stones. The vegetation type occurs as discrete areas associated with slopes and ridges from Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east, as well as most south-facing slopes and crests of the Great Escarpment between Teekloofpas and eastwards to Graaff-Reinet. Altitude varies between 1000 m and 1900 m above sea level. Mucina & Rutherford (2006)[73] list 17 species known to be endemic to the vegetation type. This is a high number given the wide distribution of most Nama karoo species and illustrates the relative sensitivity of this vegetation type compared to the surrounding Eastern Upper Karoo. As this vegetation type is associated with steep slopes, the development potential of these areas is largely low and the presence of this vegetation type may pose a constraint on the development potential of some areas, but overall this unit occupies a relatively small proportion of the site.

The Southern Karoo Riviere vegetation type is associated with the rivers of the central karoo such as the Buffels, Bloed, Dwyka, Gamka, Sout, Kariega and Sundays Rivers. About 12% has been transformed as a result of intensive agriculture and the construction of dams. Although it is classified as Least Threatened, it is associated with rivers and

[71] Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
[72] Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
[73] Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

drainage lines and those areas classified under this vegetation type should be considered sensitive. Compared to the other vegetation types, this is the only vegetation type at the Proposed Development Site which contains a significant amount of trees. The other vegetation types at the site are dominated by low shrubs and grasses with occasional larger shrubs.

5.3.1.2 Habitat Types/Landscape Units

Figure 5.1 illustrates that the vegetation types at the WEF Site have been mapped at a very coarse scale. In particular, the Southern Karoo Riviere vegetation type has been mapped only along the larger rivers, when this vegetation type occurs along most of medium-sized rivers in the study area. In practice, the vegetation of the WEF Site, is relatively homogenous at a broad scale, but is repetitively patterned within the site at a fairly fine scale, related primarily to soil texture, depth and landscape position.

Within the WEF Site, the main driver of vegetation composition is elevation. Elevation is a key driver of vegetation pattern as it has a dominant influence on rainfall as well as on temperature. Soils in the area are relatively homogenous and determined by landscape position, with significant soils accumulated only on the low-lying areas, and the majority of the WEF Site typically has gravelly clay soils or exposed weathered shale gravels with little or no soil. There are some areas of dolerite outcrops at the site as well and these areas are likely to contain significantly greater plant and animal species richness than the surrounding areas.

Although a detailed habitat type map has not been produced at this stage, the broad landscape units that were identified (Figure 5.2), along with the detailed habitat types map for the adjacent Ishwati Emoyeni site, gives an indication of the different habitats that can be encountered at the WEF Site. The large drainage systems present are a conspicuous and dominant feature, particularly of the southern part of the WEF Site, in particular the Bakensklip and Buffels River systems along with several large tributaries of these systems. These are large systems which have at least some base flow year-round. The Buffels River in particular lies within a large, often incised, river valley, the entirety of which is considered sensitive on account of the ecological role that such river corridors perform. This will be considered in the design of the Proposed Development within the EIA phase.

Apart from the drainage areas, other sensitive habitats present at the site include a number of wetlands, which may occur in association with the drainage lines, or more generally within lowland environments where saturated soils persist for several months each wet season. Within the higher-lying areas, there are some rock fields present which also contain succulent and geophyte species not found elsewhere at the site. Such specialised edaphic habitats are localised, however, and while they would need to be avoided, they are not likely to represent a significant constraint due to their small overall extent.


Plate 5.2: The southern part of the WEF Site is characterised by the presence of the Buffels River. It is important to note that it is not only the river itself which is considered sensitive, but the whole valley.


Plate 5.3: The majority of the WEF Site outside of the steep riverine valleys consists of typical karoo vegetation and is not considered highly sensitive and represents the most ecologically favourable areas for development.

Plate 5.4: Rock debris fields such as this, taken near one of wind measuring mast sites are locally sensitive habitats that should be avoided. These areas are, however, generally small and restricted and would be identified during preconstruction surveys. Although these areas may appear devoid of life, they contain an abundance of dwarf succulents and geophytes not found elsewhere.

5.3.1.3 Plant Species of Conservation Concern

According to the SIBIS database, only five species of Conservation Concern are known from the area. However, an additional species *Gethyllis longistyla,* which is classified as Rare, was observed in a rock field near one of the anemometer masts at the eastern boundary of the WEF Site. The other listed species are associated with mesic areas, such as vleis, and as these areas are intrinsically sensitive.

Some other species listed on SIBIS are relatively widespread and their local populations are not likely to be compromised by the relatively small footprint of the WEF. It is, however, likely that additional listed species occur at the WEF Site as it has not been well sampled in the past.

Surveys that will therefore be carried out at the WEF Site to confirm the presence of species not previously documented in the area; this is likely to be especially true of the river gorges and the highest-lying mountainous areas. The presence of such species will need to be confirmed through additional fieldwork which will be documents at the EIA phase and included as required in the Environmental Management Programme (EMP) for the construction of the Proposed Development.

5.3.1.4 Faunal Communities

The WEF Site falls within the distribution range of approximately 53 terrestrial mammals, indicating that mammalian diversity is potentially high. The WEF Site is extensive and topographically diverse, suggesting that a large proportion of these species are likely to occur at the site.

Species observed during the screening visit to the WEF Site, or to the adjacent Ishwati Emoyeni site, include Greater Kudu *Tragelaphus strepsiceros*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Springbok *Antidorcas marsupialis*, Steenbok *Raphicerus campestris*, Cape Hare *Lepus capensis*, South African Ground Squirrel *Xerus inauris*, Yellow Mongoose *Cynictis penicillata*, Bat-eared Fox *Otocyon megalotis*, Namaqua Rock Mouse *Aethomys namaquensis*, Bush Vlei Rat *Otomys unisulcatus* and Cape Porcupine *Hystrix africaeaustralis*. Three listed species potentially occur at the site, the Black-footed Cat *Felis nigripes* (Vulnerable), Leopard *Panthera pardus* (Near Threatened) and Honey Badger *Mellivora capensis* (SARDB Endangered).

In terms of the listed mammals, it is possible that there are Leopard in the area given the rugged topography of the site, while the Black-footed Cat and Honey Badger probably also exist at the WEF Site at low densities as is typical for these species within arid environments. Although some impact on these species may occur as a result of development in the area, they are widespread species and this would not be likely to compromise the local or regional populations of these species.

It is not considered likely that the Riverine Rabbit *Bunolagus monticularis* exists at the WEF Site as this species is associated with silty floodplains. If it were to exist anywhere at the WEF Site, it would likely be on the lowland floodplains of the major rivers. As long as these areas are avoided by the Proposed Development, the likelihood of impact on this species can be discounted.

In terms of reptiles, it is possible that the Plain Mountain Adder *Bitis inornata* might be present within the high-lying parts of the WEF Site, at elevations above 1600 m. It is currently listed as Endangered and the population has apparently declined significantly in recent times. Although they have not been recorded at the WEF Site, the area has not been well investigated and there remains a reasonable probability of Plain Mountain Adders being present. Although the presence of this species would not prevent development from occurring, it highlights that areas above 1600 m may have additional

high-elevation species present and these areas should be considered higher sensitivity as a result.

Given the abundance of permanent and semi-permanent water in the area, the diversity and abundance of amphibians at the site is likely to be reasonably high. However, no listed species are likely to be present at the WEF Site. The distribution of amphibians is likely to mirror the distribution of surface water and as such the major rivers would be the primary concern regarding amphibians. As these areas should be well buffered and avoided by the WEF, a significant direct impact on amphibians would be unlikely to occur. An indirect impact on amphibians arises from soil erosion, leading to siltation and degradation of their habitat. As the area falls within or near to areas identified as priority catchments under the NFEPA, erosion risk is a primary concern for the Proposed Development.

5.3.1.5 Critical Biodiversity Areas (CBA)

The WEF Site falls within the planning domain of the Central Karoo District Municipality (CKDM), who have produced Critical Biodiversity Area maps. Figure 5.3 indicates the CBA status of the area, as well as the underlying reasons that certain areas were designated as CBA or Ecological Support Areas (ESA). In some cases there may be several reasons that an area is designated as a CBA or ESA and so it is not possible to illustrate all the possible combinations. In this instance the dominant or most relevant reason has been illustrated. It should also be noted there is some uncertainty around the designation of certain CBA's and the more localised scale of the environment with the mapped areas. As such while the CBA's are an important consideration in this scoping level study, further field based work during the EIA phase will need to be undertaken to confirm their implications in terms of the design of the Proposed Development and associated level of impact.

A large proportion of the southern part of the WEF Site is designated a CBA, while a large part of the eastern section of the site is designated as an ESA, based on the site falling within an area classified as part of a priority catchment identified under the NFEPA (Figure 5.3).

The central northern part of the WEF Site is not classified as an ESA or CBA because it falls within the Northern Cape, where no equivalent systematic conservation planning has been conducted. As there is some uncertainty as to the conservation value of this area compared to the Western Cape section for which a CBA zones have been developed, it represents a potential opportunity for development, provided that no major sensitivity issues are identified within this area during ongoing field work.

The areas of CBA are largely associated with the major river corridors and these areas are thus considered sensitive and this will be considered in the design phase of the Proposed Development.

Development within areas classified as CBA is not recommended. The CBAs at the WEF Site designate unique areas that cannot be found elsewhere in the landscape and as such, impact on these areas are likely to result in significant impacts on biodiversity in the absence of mitigation, which may be difficult to implement. Where mitigation may not be possible, enhancement measures could be considered.

Further consideration is required of the extensive ESA which occupies the eastern part of the site (approximately 1/3 of the WEF Site area). Within this area, the primary constraint would be the areas classified as ESA on account of being within a NFEPA priority catchment (for the aquatic environment, rather than terrestrial biodiversity). Therefore some development within these areas may be possible if it could be demonstrated that it would not impact the aquatic environment. Potential erosion and

changes in stream flow would be the main impacts that would need to be addressed or mitigated with regards to the possibility of development in this area.

The ESAs are less important for biodiversity maintenance within themselves, but may be important for maintaining the integrity and functioning of an adjacent area, in this case the aquatic ecosystems. As such, habitat loss within the ESAs is less of a concern than in the CBAs, but is not considered desirable as it may ultimately degrade the supporting role of the ESA.

5.3.1.6 Site Sensitivity Assessment

Sensitivity Mapping

A draft ecological sensitivity map (Figure 5.4) of the site has been produced by integrating the available ecological and biodiversity information (excluding conservation planning designations).

As a starting point, mapped sensitive features such as wetlands, drainage lines and water bodies were collated and buffered where appropriate to comply with legislative requirements or suggested ecological considerations. Additional sensitive areas were then identified from the satellite imagery. All the different layers created were then merged to create a single coverage.

Features that were specifically captured in the sensitivity map include drainage features, wetlands and dams, as well as rocky outcrops and steep slopes. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a low impact on ecological processes and terrestrial biodiversity. This category represents transformed or natural areas where the impact of development is likely to be local in nature and of low significance with standard mitigation measures;
- **Medium** – Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion are low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken;
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas should only proceed with caution as it may not be possible to mitigate all impacts appropriately;
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas should be avoided as much as possible.

In some situations, areas were also categorised between the above categories, such as Medium-High, where an area appeared to be of intermediate sensitivity with respect to the two defining categories.

Highly sensitive features that should be avoided include the very steep slopes of the WEF Site, as well as the drainage systems. In the sensitivity map, a 500 m buffer (in either direction) has been implemented around the larger rivers, to create a 1 km wide corridor along them which will be the starting point for initial design considerations. As the design process progresses these buffers maybe amended for example due to the presence of NFEPAs.

Steep slopes are considered sensitive due to their high biodiversity as well as vulnerability to disturbance from erosion.

In terms of important faunal habitats, these have largely been captured within the existing sensitive areas such as the steep slopes, river corridors, wetlands and their associated buffer areas. In general, the sensitivity map indicates that the WEF Site is fairly typical of mountainous terrain, and although the steep slopes and drainage lines are sensitive, the intervening areas are of less sensitivity. The abundance of listed and protected species in the area is quite low and impacts on vegetation and flora within the less sensitive areas is likely to be relatively low. There may be some localised sensitive habitats present, such as rock fields and gravel patches, with specialised species present, but these are not usually extensive and would be identified through field surveys during the EIA and will be taken in account during the process of confirming the final design layout and development the EMP.

The resulting sensitivity map presents a summary of the reported desk based information to date. It is noted this will need to be ground trothed through site visits in order to confirm the constraints upon the design of the Proposed Development.

5.3.1.7 Integrated Sensitivity Assessment

Figure 5.4 considers only terrestrial ecological factors and does not take account of the systematic conservation planning for the area. As these are different issues, they need to be considered independently but, as both will contribute towards the significance of the assessed impacts, an integration is useful. The manner in which the two are combined is however to some extent subjective and depends on the perceived relative weighting of the two as constraining factors for the Proposed Development. In Figure 5.5, the ecological sensitivity map is combined with the CBA map (Figure 5.3) for the area to provide an integrated map which indicates potential ecological constraints. It should be noted that this information is indicative at this stage. As noted in Section 5.3.1.5, there is uncertainty around the designation of CBAs and hence these constraints would need to be determined through ongoing field work during the EIA phase.

In terms of the distribution of the different sensitivity categories, high sensitivity areas occupy a large proportion of the central and southern part of the WEF Site. However, a large proportion of the WEF Site is considered low-risk and represents those parts of the site most favourable for development. These are typically plains dominated by typical Karoo species on gravelly soils, as depicted in Plate 2. Biodiversity within these areas is generally quite low and there do not appear be any key features present that would generate significant impacts. Local exceptions that might need to be avoided would include some areas of dolerite outcrops as well as unique edaphic (soil and environment) habitats such as the rock fields depicted in Plate 3. Such features are however localised in extent.

The eastern part of the WEF Site falls within a large ESA, as it falls within the catchment of a priority river system. This will need to be considered in the design of the WEF subject to site specific findings during the EIA phase. As stated in section 5.3.1.5 this would largely be considered through the assessment of aquatic impacts associated with being within a NFEPA priority catchment.

5.3.2 The Grid Connection Site

The Proposed Development can be split into the WEF site and the Grid Connection Site. With regard to the Grid Connection Site, the relevant CBA and National Vegetation Classifications are presented in Figures 5.6 and 5.7 respectively.

These areas will be taken into account during the EIA phase in terms of designing the power line infrastructure, and similarly used to inform the EMP content regarding the pre-construction ecological walk through of the route. As such no sensitivity mapping has been produced to date regarding the Grid Connection Site.

5.4 Potential Impacts and Mitigation

Based on the characteristics of the Proposed Development Site, as well as impacts that were identified and assessed at the adjacent Ishwati Emoyeni WEF, potential direct impacts have been identified in sections 5.4.1 – 5.4.3. Cumulative impacts are discussed in section 5.4.4.

Indirect impacts are likely to result from noise generated by the Proposed Development (construction and decommissioning activities, and from wind turbines during the operation phase) as well as human presence which may deter shy species from the area as well as disrupt the connectivity of the landscape for such species.

5.4.1 Construction Phase

5.4.1.1 Impacts on Vegetation and Protected Plant Species

Site clearing for roads, turbines and other infrastructure would result in the loss of currently intact vegetation. This may include protected and red-listed plant species as well as their habitats. This impact is highly likely to occur in all areas where development takes place and as such will be assessed for the WEF as well as the grid connection.

5.4.1.2 Alien Plant Invasion Risk

The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion. Although this impact is generated during construction, it is only expressed during operation and is therefore assessed for the operational phase and not for construction. Some invasion of short lived weedy species may occur during construction; however, their control would occur largely during the operational phase after the commissioning of the site.

5.4.1.3 Increased Erosion Risk

Increased erosion risk would result from soil disturbance and the loss of plant cover within cleared and disturbed areas. The Proposed Development Site is topographically diverse and includes a number of steep slope areas that would be vulnerable to erosion impact. There are also a large number of drainage lines present that would be potentially disturbed by the construction of the Proposed Development and the risk of erosion problems would therefore be high. As the larger rivers at the Proposed Development Site are considered priority rivers under the NFEPA, erosion leading to impact on the riverine ecosystems would be highly undesirable.

Due to the extensive disturbance likely to be created by construction of the Proposed Development in the absence of mitigation, the greatest potential for soil erosion impacts is within the WEF, but could potentially occur along the power line route. Best practice construction measures, including water management and run-off control measures, will be proposed in the EIA to minimise erosion and consequent effects on downstream receptors.

5.4.1.4 Faunal Impacts

Increased levels of noise, disturbance and human presence would be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species might not be able to avoid the direct construction activities. Some mammals and reptiles, such as tortoises, could be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present and increased access to the area. There are also some mammals of conservation concern which exist in the area, and impacts on these species would be

undesirable. Whilst some habitat loss for these species is likely to occur, this would not be of high significance given the scale of the Proposed Development relative to the large distribution extent of these species.

Due to the large amount of activity and equipment operating during construction, faunal impacts are highly likely within the WEF, but less likely along the power line route as construction activity will be more localised and of shorter duration. Consequently it is proposed that faunal impacts be assessed only for the WEF, but not the grid connection.

5.4.2 Operational Phase

5.4.2.1 Alien Plant Invasion Risk

The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion. This would be a particular concern if it resulted in the spread of large woody species such as Prosopis which can have ecosystem-level consequences for hydrology as well as biodiversity and the delivery of ecosystem services.

This impact is more likely to occur where extensive or recurrent disturbance takes place and as such is more likely to occur within the WEF. Disturbance along the grid connection would be limited and of much shorter duration. Consequently it is proposed that alien plant invasion impacts be assessed only for the WEF.

If significant impacts are predicted in the EIA, mitigation will be proposed to minimise such effects through management measures.

5.4.2.2 Faunal Impacts

Increased levels of noise, disturbance and human presence during operation may be detrimental to fauna. Noise generated by the turbines may have some impact on sensitive fauna, while other species may avoid the area on account of the increased levels of activity in the area. Many species would however become habituated to the WEF and would return to normal activity after some time. Faunal impacts during operation are possible within the WEF, but are considered unlikely along the grid connection corridor due to the low activity and limited scope for interaction of the infrastructure with fauna.

5.4.2.3 Loss of Landscape Connectivity and Disruption of Broad-Scale Ecological Processes

The presence of the WEF and associated infrastructure could potentially contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. Many fauna avoid crossing open areas, or are vulnerable to predation when doing so, and as such the extensive road network which would be required for the Proposed Development would contribute to this impact on a long-term cumulative basis. This impact is considered potentially significant only for the WEF and it is highly unlikely that the grid connection corridor would contribute significantly to this impact.

5.4.3 Decommissioning Phase

During the decommissioning phase the impacts would be:

- Alien Plant Invasion Risk;
- Increased erosion risk; and
- Faunal impacts.

The nature of these impacts is similar to that for the construction phase, but the magnitude is much reduced as a result of the reduced level of disturbance during decommissioning. No additional clearance or soil disturbance for access tracks, turbine

foundations or hardstandings would be required during decommissioning. As a result, impacts associated with decommissioning are not considered likely to be significant and are not proposed to be assessed in the EIA.

5.4.4 Cumulative Impacts

Developments that could lead to cumulative impacts on terrestrial ecology in combination with the Proposed Development are limited to the adjacent Ishwati Emoyeni WEF. Although there are a number of other proposed WEFs in the broader area (within 100 km), these are within a different ecological environment from the Proposed Development Site and so would not contribute directly to the cumulative loss of similar habitat.

5.4.4.1 Reduced Ability to Meet Conservation Obligations and Targets

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's ability to meet its conservation targets. Although all of the vegetation types in the study area are classified as Least Threatened, they are mostly poorly protected and certain habitats or communities may be disproportionately affected. This impact would result largely from the WEF itself. The grid connection would contribute very little to this impact and is therefore not considered a significant contributor relative to the WEF itself.

The anticipated low levels of change to the affected habitat types indicates that the Proposed Development is not likely to lead to a significant cumulative impact such that it would compromise the country's ability to meet national conservation targets.

5.4.4.2 Impact on Critical Biodiversity Areas and Cumulative Disruption of Broad-Scale Ecological Processes

Transformation within CBAs would potentially disrupt the functioning of the CBA or result in biodiversity loss. In addition, the presence of the Proposed Development could potentially contribute to the cumulative disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. There are a number of other renewable energy facilities in the wider vicinity of the Proposed Development and the cumulative impact of these on habitat loss and the broad scale disruption of landscape connectivity is a potential concern. This impact results from the WEF itself and the grid connection is not considered a significant contributor.

5.5 Relevant Stakeholders/ Consultees

CapeNature, the provincial Department of Environmental Affairs and Nature Conservation (DENC) in the Northern Cape, and the Department of Environmental Affairs and Development Planning (DEADP) in the Western Cape represent the most important stakeholders in terms of ecological impacts; both are likely to comment on the scoping report and it is noted that CapeNature provided a variety of comments on the adjacent Ishwati Emoyeni EIA.

Other stakeholders will include provincial authorities and local farmers. The provincial authorities will have access to the scoping report and subsequent EIA and will be consulted as IAPs. Local farmers are likely to voice their concerns through the public participation process.

5.6 Assessment Methods

5.6.1 Assessment Approach and Philosophy

The assessment will be conducted according to the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998), in terms of the Environmental Conservation Act No. 73 of 1989, as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e., CBAs (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas;
- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), as amended, which, amongst other things, indicates that environmental management should:
    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy.

The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, providing a description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

5.6.1.1 Pattern

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc).

Species level

- Red Data Book (RDB) species (giving location where possible);
- The viability of an estimated population size of the RDB species that are present (including the degree of confidence in prediction based on availability of information and specialist knowledge, i.e., High=70-100% confident, Medium 40-70% confident, low 0-40% confident); and
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- The terrestrial fauna present in the area that will be affected by the Proposed Development;
- A faunal assessment that can be integrated into the ecological study;
- The existing impacts of current land use as they affect the fauna;
- Species of special concern and that are known to be:
  - endemic to the region;
  - that are considered to be of conservational concern;
  - that are in commercial trade (CITES listed species); or
  - are of cultural significance;
- Monitoring requirements, as input into the EMP for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity;
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites); and
- The condition of the site in terms of current or previous land uses.

5.6.1.2 Process

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire;
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e., corridors such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and vegetation boundaries such as edaphic interfaces, upland-lowland interfaces or biome boundaries);
- Any possible changes in key processes, e.g., increased fire frequency or drainage/artificial recharge of aquatic systems;
- Any further studies that may be required during or after the EIA process; and
- All relevant legislation, permits and standards that would apply to the Proposed Development.

The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy. This information will feed into the design process to identify where embedded mitigation can be used to minimise impacts.

Once this information has fed into the design, the potential impacts of the resulting Proposed Development will be assessed utilising a method following the process highlighted in Section 1.2.5 of this report.

6 BATS

6.1 Introduction

Natural Scientific Services CC was commissioned to conduct 12 months of bat monitoring according to the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments[74] so as to form part of the EIA process for the WEF and its associated grid infrastructure.

The onsite monitoring for the WEF component of the Proposed Development commenced in mid-July 2013 and will continue until mid-July 2014. The monitoring to date has been used to inform the content of this Draft Scoping Report.

The aim of the current monitoring programme is to determine the potential impacts on bats due to the WEF component of the Proposed Development and if necessary to make mitigation recommendations to avoid or reduce potential impacts. This is done through gathering the following information:

- Assemblage of bat species using the site;
- Relative frequency of use by different species throughout the year;
- Spatial and temporal distribution of activity for different species;
- Identification of roost locations within and close to the WEF Site;
- Determining the presence of rarer species; and
- Type of use of the site by bats – at and away from turbine locations, for example foraging, commuting, migrating, roosting, etc.

With regard to the grid infrastructure, this will be considered at the EIA stage when a site visit will be completed to advise on the design. The impacts on the grid infrastructure for bats are not as potentially significant as those of the WEF and hence the WEF requires more attention in the EIA process.

6.2 Baseline Survey Methods

6.2.1 Desktop Review

A desktop review of literature, legislation and the Likelihood of Occurrence (LoO) of specific species has commenced. The LoO was done according to the species distribution maps provided in Monadjem et al. (2010)[75]. The LoO was categorised as follows:

- If a species has been historically recorded within the relevant quarter degree squares (QDS), it was assigned a High LoO;
- If a species' range includes the relevant QDS, the species was assigned a Moderate LoO;
- If the site's QDS is adjacent to an area where a species range extends, that species was assigned a Low LoO; and
- Species known to definitely not occur within the WEF Site were not listed.

6.2.2 Surveys

Surveys of the WEF Site have commenced and will be carried out between mid-July 2013 and mid-July 2014, with the aim of achieving bat acoustic monitoring for a minimum of

[74] South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments 2011. Adapted from: The Bat Conservation Trust's Bat Surveys – Good Practice Guidelines Revised 2011. Compiled by Sandie Sowler and Samanth Stoffberg. Available online: http://www.ewt.org.za/programmes/WEP/pdf/SA_Wind_Survey_Guidelines_FINAL_April%202011.pdf Accessed 17/06/2014.

[75] Monadjem, A., Taylor, P.J., CotterilL, F.P.D. & Schoeman, M.C. 2010. Bats of southern Africa: a biogeographic and taxonomic synthesis. University of Witwatersrand Press, Johannesburg.

75% of the year over the monitoring stations. This Draft Scoping Report includes information obtained from 8 months of monitoring, for the period mid-July 2013 to mid-March 2014.

With regard to the Grid Connection Site, a site visit will be undertaken at the EIA phase in order to inform the design and layout. The aim will be to avoid area of high sensitivity to bats with regard to high value migratory corridors and habitats.

With regard to the WEF Site, the following survey techniques, in line with the requirements of the Best Practice Guidelines, are being used.

6.2.2.1 Activity Surveys - Static monitoring at Ground Level and Height

17 static monitoring locations were established in mid July 2013, as shown in Figure 6.1. These locations were evenly distributed across the Proposed WEF Site with coverage in all of the various biotopes.

The bat sound recording equipment used for the static monitoring is the Wildlife Acoustics Song Meter SM2BAT Ultrasonic Recorder. At 15 stations the microphones were installed on an aluminium mast at 9.5 m above ground on temporary masts at stations, with the remaining detectors being set up on the two meteorological masts with microphones on each at 10 m and 55 m above ground (TB10 and TB17). The bat monitors record bat calls as a measure of the presence of bats in the area.

A bat call consists of a series of ultrasonic sound pulses, with each species calling at a different sound frequency. Pulses within a bat call can also vary in their sound frequency and characteristics, although this variation is within a certain range associated with a certain bat species.

Bat activity levels can either be measured by the number of bat pulses or bat activity can also be calculated in the following way:

Activity Index = Bat passes / unit time**

** A bat pass is defined as a sequence of greater than two echolocation calls made as a single bat flies past the microphone. It is important to note a bat pass is an indicator of the number of bats in the area however for 10 bat passes, the detector cannot determine if this was caused by one bat flying past 10 times, or 10 bats flying past once. This must be determined by the interpretation of the data by the specialist team and their knowledge of the area and the characteristics of the bat species.

Bat activity levels will also be analysed against temperature and wind data obtained from the meteorological masts.

6.2.2.2 Roost Surveys

By day, the main potential bat habitats on site, such as trees, ridges, gorges and rocky outcrops, farm buildings and culverts are investigated by torch light and hand held acoustic bat detectors for the presence of bats. Desktop research and discussions with locals and farmers on potential known roost sites such as caves is ongoing. Should any bat roosts be discovered, these sites will be investigated in the field.

6.3 Baseline Environment

Mucina and Rutherford (2006)[76] classify three regional vegetation types for the WEF site boundary: the Eastern Upper Karoo, with pockets of Upper Karoo Hardeveld and very

[76] Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

small areas of Southern Karoo Rivierie (Figure 5.1). From a bat perspective, it is predicted that the smaller pockets of Upper Karoo Hardeveld and Southern Karoo Riverie, as well as homesteads and agricultural areas, will have the highest activity levels.

Climatic conditions for the region are typical of the Karoo, with relatively low rainfall in autumn and summer, peaking at the highest rainfall in March. Incidence of frost is relatively high, and mean maximum and minimum monthly temperatures of >36°C and <-7°C in summer and winter respectively.

Including only nights when bats were recorded, an average of 33 bat passes per bat monitoring station per date were recorded. Of the 5 confirmed and 3 suspected species encountered during the monitoring at the WEF Site to date, 1 species is at High risk, 2 at Medium-High risk, 1 at Medium risk, and 4 are at Low risk of fatality. A list of the species confirmed and those suspected are included in Table 6.1.

Table 6.1 Bat Species Identified

Family	Species	Common Name	Status (National)	Status (Global)	Habitat And Foraging Behaviour	Confirmation Method
MINIOPTERIDAE	*Miniopterus natalensis*	Natal long-fingered bat	Near Threatened	Least Concern	Its core distribution is in the savannahs and grasslands of southern Africa. It is cave dependent and hence the availability of suitable roosting sites may be more critical in determining its presence in an area than the surrounding vegetation. Aerial clutter-edge forager, known to migrate long distances between roost caves. It feeds on a variety of prey – Diptera, Hemiptera, Coleoptera, Lepidptera and Isoptera.	Confirmed – calls only
MOLOSSIDAE	*Tadarida aegyptiaca*	Egyptian free-tailed bat	Least Concern	Least Concern	Crevice dwelling species, commonly associated with granite hills and the numerous cracks provided in such terrain. Aerial open-air foragers	Confirmed – calls only
RHINOLOPHIDAE	*Rhinolophus clivosis*	Geoffroy's horseshoe bat	Near Threatened	Least Concern	Roosts in caves and mine adits and can reach numbers of thousands. It is a clutter forager, eating mainly Lepidoptera and Coleoptera	Confirmed – calls only
RHINOLOPHIDAE	*Rhinolophus capensis*	Cape horseshoe bat	Near Threatened	Least Concern	Endemic to south-west southern Africa. Thousands of individuals may roost in caves & mine adits. It is closely tied to the fynbos & succulent karoo biomes. It is a clutter forager in the canopy of trees.	Confirmed – calls only
VESPERTILIONIDAE	*Cistugo lesueri*	Lesueur's wing-gland bat	Near Threatened	Least Concern	Roosts in rock crevices, usually near water. Associated with the broken terrain of high altitude montane grassland. Aerial clutter-edge forager.	Suspected - Calls recorded similar to their call structure
VESPERTILIONIDAE	*Eptisicus hottentotus*	Long-tailed serotine bat	Least Concern	Least Concern	Roosts in small groups of 2-4 in caves and rock crevices. Aerial clutter-edge forager.	Suspected - Calls recorded similar to their call structure
VESPERTILIONIDAE	*Neoromicia capensis*	Cape serotine bat	Least Concern	Least Concern	Roosts singly or in small groups of two or three individuals under the bark of trees, at the base of aloe leaves, and under the roofs of houses. Aerial clutter-edge forager.	Confirmed – calls only
NYCTERIDAE	*Nycteris thebaica*	Egyptian slit-faced bat	Least Concern	Least Concern	Resident of Savanna and Karoo biomes. Roosts in a variety of day roosts from caves, Aardvark burrows, culverts, trunks of trees, etc. Also makes use of night roosts such as barns, rock overhangs, etc. in which prey-items are consumed. It is a clutter forager.	Suspected night roosts found on site

6.4 Potential Impacts and Mitigation

WEFs have the potential to impact bats directly through collisions and barotrauma[77] resulting in mortality (Horn *et al*. 2008[78]; Rollins *et al*. 2012[79]), and indirectly through the modification of habitats (Kunz *et al.* 2007b[80]).

Due to their movement and foraging behaviour, certain bat species are at higher risk of fatality due to wind turbine collision or barotrauma than others. Open-air foragers, clutter-edge foragers and migrating species are at the highest risk.

With regard to the grid connection infrastructure, there is potential for disturbance during construction and decommissioning activities and collision during the operational phase.

The following potential direct impacts are relevant to the Proposed Development:

- Roost disturbance and/ or destruction due to construction activities if this involves clearing of trees or dwellings, or construction occurs near or on rock outcrops;
- Fragmentation to and displacement from foraging habitat due to wind turbine construction and operation through noise and dust disturbance and intersection of flight paths;
- Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity or attraction to turbines;
- Fatalities of migrating species due to collision or barotrauma during migration;
- Roosting or foraging habitat disturbance due to overhead power line construction; and
- Bat fatalities due to collision with overhead power lines.

In the event that impacts are predicted which are assessed as being unacceptable, potential mitigation measures will be considered. This may include embedded mitigation, i.e., the design of the WEF, and if further mitigation is required, operational strategies:

- Designing the layout of the turbines to avoid Medium-High and High bat sensitivity zones;
- Selection of turbines with rotor swept areas which are outside the zones of highest bat activity (this may be a factor of the height and size of the rotor swept area); and
- Curtailment and/or feathering (reducing the angle of the turbine blades) of certain turbines during specific times of year and/or night; and/or
- Design and siting of grid infrastructure to avoid high value areas for bats.

6.5 Relevant Stakeholders/ Consultees

The following stakeholders and consultees have been identified with regard to bats for the Proposed Development:

- South African Bat Assessment Advisory Panel (SABAAP);
- Western Cape Nature;
- Northern Cape Department of Environment and Nature Conservation (DENC);
- Department of Environmental Affairs and Development Planning (DEADP) in the Western Cape

[77] Tissue damage to air-containing structures (such as lungs) caused by rapid or excessive air-pressure changes.

[78] Horn, J. W., E. B. Arnett, and T. H. Kunz. 2008. Behavioral Responses of Bats to Operating Wind Turbines. The Journal of Wildlife Management **72**:123-132

[79] Rollins, K. E., D. K. Meyerholz, G. D. Johnson, A. P. Capparella, and S. S. Loew. 2012. A Forensic Investigation Into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? Veterinary Pathology Online **49**:362-371

[80] Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Frontiers in Ecology and the Environment **5**:315-324

- Eastern Cape Parks and Tourism Agency.

6.6 Assessment Methods

The assessment will be conducted in line with the following EIA process:

- Describing the baseline environment regarding bats through survey methods and desk study as described above;
- Determining the sensitivity of the bats with the Proposed Development Site utilising published data sources;
- Identifying and characterising the potential impacts in relation to the Proposed Development of a WEF and grid infrastructure considering the Magnitude, Extent, Duration and Reversibility of the impact;
- Feeding into the design of the Proposed Development so as to include embedded mitigation;
- Determining the significance of effects in line with the resultant design;
- Consideration of cumulative impacts with other development in the area, primarily WEF developments;
- Where impacts are predicted that are unacceptable, developing a strategy for mitigation, compensation, enhancement and monitoring measures associated with the Proposed Development. This will include management practices which will be input into the EMP; and
- Describing the residual effects, i.e., those remaining after mitigation, management and implementation of the EMP.

7 WETLANDS AND FRESHWATER

7.1 Introduction

Scherman Colloty & Associates (SC&A) was commissioned to conduct an aquatic and Present Ecological State (PES) assessment of all water bodies located within the Proposed Development Site as well as those within a 500 m radius of the Proposed Development Site (together referred to as the Study Area), shown on Figure 7.1.

7.2 Baseline Methods

This Chapter of the Draft Scoping Report follows a desktop assessment of the available information on aquatic systems found in the region, as well as other data sources known to the author. This will be followed by a site visit and then a detailed specialist report will form part of the EIA and the Water Use License Application (WULA) to the Department of Water Affairs (DWA) (if required)[81].

7.3 Baseline Environment

The WEF Site falls within three quaternary catchments of the Gamtoos Water Management area (Quaternary catchments, L21C, L21D & L21E) and the Grid Connection Site boundary extends over three quaternary catchments, namely L21A, L21b & L21C.

Several main stem rivers are found within these catchments (Figure 7.1) which form part of the Brak River. These tributaries include:

- Skietkuilspruit;
- Brak River;
- Snynderskraal River;
- Buffels River; and
- Several unknown tributaries.

Figure 7.1 illustrates those rivers which are identified under NFEPA project[82], and their associated PES categories. The PES categories are presented in Table 7.1.

Table 7.1. PES Description A – F Ecological Categories [83]

Ecological Category	Ecological Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.

[81] Note this is likely to be applied for if required after achieving Preferred Bidder status through the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP)

[82] Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

[83] Kleynhans C.J. 1999. A procedure for the determination of the ecological reserve for the purposes of the national water balance model for South African River. Institute of Water Quality Studies, Department of Water Affairs & Forestry, Pretoria

Ecological Category	Ecological Description
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

With regards to aquatic vegetation, the Proposed Development Site is dominated by species associated with the Nama Karoo vegetation ecosystem. These systems are usually devoid of any trees with strict riparian or wetland affiliations and this is due to the largely ephemeral nature of the rivers / water courses within the region. However the larger systems, such as those listed above have a higher Mean Annual Runoff and thus contain a woody layer component within the riparian floodplain areas which are dominated by *Acacia karroo*, *Searsia lanceolata* and *Combretum* species.

Several water bodies and aquatic systems are shown with preliminary delineations, indicated in Figure 7.2. Based on the 6 levels of the National Wetland Classification System, these systems are typical of Inland Systems (Level 1), within the Drought Corridor Ecoregion (Level 2). Wetland landscape units (Level 3) were valley floors (riparian / palustrine) or un-channelled valley bottom hydrogeomorphic units (Level 4). Several of these have been indicated in the National Wetland Inventory, however upon closer inspection of the aerial images, and the NFEPA database (Nel *et al*., 2011) most of the indicated wetlands are man-made systems. This will be confirmed during the EIA phase of this study.

Within the remaining waterbodies, given the low annual rainfall, the water courses infrequently contain any surface runoff or open water (Level 5), but would remain important habitat or refuges within a landscape when flowing or inundated. The PES of these systems was rated by the DWA in 1999[84]. All of the study area river systems were rated as Moderately Modified with PES scores of C. These scores are presently being revised by SC&A and will become available during the EIA phase, however it is anticipated that these rating would remain unchanged (i.e., PES = C or D). The updated assessment will also include the Ecological Importance and Sensitivity rating, which will be required by DWA in their assessment of the potential WULA for the Proposed Development and will be available during the course of the EIA phase of the assessment.

Of interest is the NFEPA project[85], where several important catchments (sub-quaternaries or SQ) have been earmarked, based either on the presence of important biota (e.g., rare or endemic fish species) or the degree of riverine degradation, i.e., the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs).

The study area contains several of these FEPAs, which are based on either their role in containing fish species of special concern or their potential as support habitats, associated with main stem rivers (Figure 7.3). These habitats include lower and upper mountain foothills, important for the Chubbyhead barb (*Barbus anoplus*) and *Pseudobarbus asper* (Smallscale redfin) fish species. The later species is Endemic to South Africa and is listed as Endangered.

[84] Kleynhans, C.J. (2000). Desktop estimates of the ecological importance and sensitivity categories (EISC), default ecological management classes (DEMC), present ecological status categories (PESC), present attainable ecological management classes (present AEMC), and best attainable ecological management class (best AEMC) for quaternary catchments in South Africa. DWAF report, Institute for Water Quality Studies, Pretoria, South Africa.

[85] Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

7.4 Potential Impacts and Mitigation

The layout of the Proposed Development will be assessed with regard to potential construction, operation and decommissioning impacts on the aquatic environment, with the following key issues being assessed:

- The potential loss of aquatic habitat (physical destruction);
- Loss of ecosystem services;
- Habitat fragmentation (fish support areas);
- Potential loss of Species of Special Concern (plants and fish); and
- Sedimentation and erosion.

Preliminary recommendations, based on the observed water bodies, would be to utilise a 32 m set-back distance around all the delineated water courses / rivers (as far as possible) with wetlands receiving a 50 m set-back. These set-back recommendations will be finalised once the specialist site visit has been conducted but are based on national guidelines that will be discussed in detail within the EIA report. Consideration will be given to the ecological status of these river systems as noted in Section 5 above; a greater set-back around rivers and wetlands maybe required for terrestrial ecology purposes.

These set-back distances will feed into the design process along with other recommendations for embedded mitigation which may include utilising existing roads with river / water crossings as far as possible so as to minimise the number of new crossings, which would also limit the need for WULA as no beds or banks of the systems would be altered, or flows impeded.

7.5 Relevant Stakeholders/ Consultees

The DWA will be consulted in relation to both the EIA phase and any requirement for WULA.

7.6 Assessment Methods

In order to meet the EIA and WULA requirements, the following approach is proposed:

- An assessment of the aquatic biodiversity of the study area. This will cover the Proposed Development in relation to available ecological information related to wetland and riverine ecosystems functioning within the region;
- A map demarcating the relevant local drainage area of the respective wetland/s, i.e., the wetland, its respective catchment and other wetland areas within a 500 m radius of the study area. This will demonstrate, from a holistic point of view the connectivity between the site and the surrounding regions, i.e., the zone of influence;
- Maps depicting demarcated wetland areas delineated to a scale of 1:10,000, following the methodology described by the Department for Water Affairs and Forestry (2005), together with a classification of delineated wetland areas, according to the methods contained in the Level 1 WET-Health methodology and the latest National Wetland Classification System (2010);
- The determination of the ecological state of any wetland areas, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services. SC&A is presently assessing the PES as part of a 2 year Water Research Commission funded study and is thus developing the latest PES methods in collaboration with the DWA. Note that this determination will not include avifaunal, herpetological or invertebrate studies; however possible habitat for species of special concern would be commented on;
- Recommend set-back zones around any delineated wetland areas based on the relevant legislation, e.g., any bioregional plans of conservation guidelines or best practice;

- Assess the potential impacts, based on a methodology based in Section 1.2.5 of this scoping report;
- Cumulative impacts for water and freshwater are largely expected to be limited to the neighbouring Ishwati Emoyeni WEF and associated grid infrastructure, plus the cumulative effects of the four components of the Proposed Development as outlined in Section 1.2.5 of this report;
- Provide mitigation measures regarding project related impacts, including engineering services that could negatively affect demarcated wetland areas; and
- Recommend specific actions that could enhance the wetland functioning in the areas, allowing the potential for a positive contribution by the Proposed Development, e.g., useful of artificial wetlands in storm water control.

8 AVIFAUNA

8.1 Introduction

Arcus were commissioned to provide avifaunal specialist for the Proposed Development. This includes 12 months of avifaunal monitoring in line with the Best Practice Guidelines for Avian Monitoring and Impact Mitigation at Proposed Wind Energy Development Sites in Southern Africa[86], of which three of the four seasonal surveys have been completed.

The purpose and aims of this Chapter of the Draft Scoping Report is to provide:

- The scoping exercise adopted for avifauna which led to the development of a monitoring programme;
- Description of the monitoring programme underway;
- A review of the main findings of the first two monitoring surveys.
- A description of the avifaunal baseline, including a description of avifaunal microhabitats; and
- A description of potential predicted impacts to avifauna and approach to impact assessment.

8.2 Baseline Survey Methods

The baseline avifauna environment for the Proposed Development Site was defined utilising a desk based study plus site visits to the WEF Site. No site visit has yet been conducted at the Grid Connection Site and this will be completed during the EIA phase.

8.2.1 Desk Study

The following data sources were examined to determine the potential location and abundance of avifauna which may be sensitive to the Proposed Development, and to understand their conservation status and sensitivity:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP-1)[87] obtained from the Avian Demography Unit of the University of Cape Town;
- The Southern African Bird Atlas Project 2 (SABAP-2) [88];
- Co-ordinated Water-bird Count (CWAC) project[89];
- The Important Bird Areas of southern Africa (IBA) project[90];
- Publically available satellite imagery;
- Results of the first two seasonal avifauna surveys conducted by Arcus as part of the pre-construction avifaunal monitoring programme (WEF Site only); and
- Avifaunal Impact Assessment (Chapter 7), in the Combined Environmental Impact Assessment for the Proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape[91] (Grid Connection Site only).

[86] Jenkins A.R., van Rooyen. C.S, Smallie. J.J, Anderson. M.D & Smit.H.A, 2011. Available online at http://www.ewt.org.za/programmes/WEP/pdf/BAWESG_Monitoring%20guidelines_Version%201_04042011.pdf (Accessed 19th June 2014)

[87] South African Bird Atlas Project 1. Available online: http://adu.org.za/sabap1.php. Accessed on 17/06/2014.

[88] South African Bird Atlas Project 2. Available online: http://sabap2.adu.org.za. Accessed on 17/06/2014.

[89] Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. *Coordinated waterbird Counts in South Africa, 1992-1997*. Avian Demography Unit, Cape Town

[90] Barnes, K.N. (ed). 1998. *The Important Bird Areas of Southern Africa*. Birdlife South Africa, Johannesburg.

[91] Council for Scientific and Industrial Research (CSIR), 2014. *Combined Environmental Impact Assessment for the Proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape*.

The following limitations and assumptions are made with regards to the above data sources:

- The SABAP-1 data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in SABAP data, see the Atlas of Southern African birds[92];); and
- Species conservation status was based upon the Eskom Red Data Book[93]. This list has recently been updated but has not yet been officially published[94], as such the 2000 status was used in this report. A number of status have been upgraded and these will be considered in the EIA phase.

8.2.2 Survey Design

The significance of the potential impacts identified in section 8.4 will be assessed using the methodology set out in section 8.6 and will follow a 12 month pre-construction monitoring programme at the WEF Site, being conducted as part of the EIA.

The monitoring programme has commenced, with three out of the four survey seasons (spring, summer and autumn) having already been completed. Field work for the autumn survey (the most recent survey) has recently been completed, but analysis and reporting is still to be compiled and hence the results have not been included in this discussion.

The survey design and method has been developed in line with the best practice guidelines ('the guidelines') (Jenkins *et al.*, 2011), and also giving regard to the use of the data in informing assessment and site design from Arcus' experience.

The 12 month avifauna survey will consist of four seasonal site visits (of approximately 9-12 days each) by a team of observers, covering the WEF Site. Surveys will include:

- Flight activity surveys from 14 Vantage Points (VPs);
- 14 walked transects (each 1 km in length);
- Two 10 km driven night transects to record nocturnal birds;
- Monitoring at a control site will also be conducted;
- Large terrestrial species are recorded incidentally in the course of travelling the length of the site en route to survey locations at both the WEF and the control site; and
- Various dams will also be surveyed.

The survey at the WEF Site has indicated the potential presence of nesting Verreaux's eagles and small cliff nesting raptors. In order to fully understand these species and their activity, so it can be taken into account in the design process, specific nest surveys will be undertaken during the winter season for Verreaux's Eagle and during spring for cliff nesting raptors.

In addition to the above survey work on the WEF Site, a thorough investigation of the Grid Connection Site will be conducted by the Arcus avifaunal specialist during the EIA phase. The Grid Connection Site will be visited and traversed using both walked and driven transects to sample representative sections of all the proposed route alternatives.

[92] Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. *The atlas of southern African birds*. Vol. 1&2. BirdLife South Africa: Johannesburg.
[93] Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa: Johannesburg.
[94] Personal communication, Michael Brooks at the Avian Demography Unit- UCT

8.2.3 Survey Reporting

The data collected from the baseline surveys will be analysed by the bird specialist and collated into technical reports detailing the baseline conditions at the Proposed Development Site. The reports will include, as appropriate, data appendices, figures and confidential annexes.

8.3 Baseline Environment

8.3.1 The WEF Site – Desk Based Assessment

8.3.1.1 Southern African Bird Atlas Project 1

The SABAP-1 data was collected over an 11 year period between 1986 and 1997 and remains the best long term data set on bird distribution and abundance available in South Africa at present. This data was collected in QDS, with the WEF Site covering the following squares: 3123DB, 3123DD, 3124CA and 3124CC. Within these squares, the total number of all species recorded varied from 91 to 171, with the latter being recorded in square 3123DD, which had also been counted the most times (54 cards submitted).

Table 8.1: Raptors and Priority species[95] recorded in the quarter degree squares covering the WEF Site[96].

Species	Status	Report rate (%)			
		3123DB	3124CA	3123DD	3124CC
Total species		*91*	*141*	*171*	*128*
Number of cards submitted		*5*	*15*	*54*	*19*
Bustard, Kori	V			11	11
Bustard, Ludwig's	V	20	40	6	16
Buzzard, Jackal	-		67	65	53
Buzzard, Steppe	-	20	27	9	32
Crane, Blue	V		40	20	16
Eagle-Owl, Spotted	-		7	41	
Eagle, Booted	-				11
Eagle, Martial	V			11	5
Eagle, Verreauxs'	-	20	13	17	11
Falcon, Lanner	NT			19	
Fish Eagle, African	-		20	2	
Flamingo, Greater	NT		33		5
Francolin, Grey-winged	-	40	7	20	5
Goshawk, Gabar	-			13	
Goshawk, Southern Pale	-	60	60	67	

[95] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

[96] Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. *The atlas of southern African birds*. Vol. 1&2. BirdLife South Africa: Johannesburg.

Species	Status	Report rate (%)			
Chanting					
Harrier Hawk, African	-			2	5
Harrier, Black	NT			4	
Kestrel, Greater	-			9	
Kestrel, Lesser	V		7	11	
Kestrel, Rock	-	100	40	76	42
Kite, Black-shouldered	-			74	5
Korhaan, Black (pre-split)	-	40	7		11
Korhaan, Blue	NT		13		
Korhaan, Karoo	-	100	33	52	32
Marsh Harrier, African	V			2	
Owl, Barn	-			7	
Secretarybird	NT			9	5
Stork, Black	NT		7	17	
Stork, White	Bonn		20		

CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species. Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that these species were recorded in the entire quarter degree square in each case and may not actually have been recorded on the proposed WEF site.

8.3.1.2 Southern African Bird Atlas Project 2

This project is part of an ongoing study by the Animal Demography Unit, a research unit based at the University of Cape Town. SABAP-2 data was examined for the pentads (which are roughly 8 km by 8 km squares, and are smaller than the squares used in SABAP-1) in the study area which had been counted, showing that up to 172 species have been recorded to date (Appendix 8.1), 20 of which are Priority species[97]. Appendix 8.1 shows a combined list of 219 species recorded by both the SABAP-2 and SABAP-1 for the study area, of which 29 are Priority species. The table in this appendix shows report rates, based on the number of cards submitted, for both SABAP projects. 13 species that were not recorded during the older SABAP-1 study were recorded by SABAP-2 , including the Southern Black Korhaan (a priority species) as well as the relatively common Cape Longclaw (which has a 32.35% report rate in the SABAP-2 data).

Applicable species recorded at relatively high abundances by the SABAP data included Jackal Buzzard, Blue Crane, Rock Kestrel, Grey-winged Francolin, Karoo Korhaan, Southern Pale-chanting Goshawk and Ludwig's Bustard.

8.3.1.3 Coordinated Waterbird Count (CWAC) data

There are no CWAC sites within 50 km of the Proposed Development site.

[97] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

8.3.1.4 Important Bird Area Project (IBA)

The Proposed WEF Site is not situated within an IBA and there are no IBAs within 40 km of the Proposed WEF Site.

8.3.2 WEF Site - Pre-construction Monitoring

The first of four seasonal survey visits (spring) to the Proposed WEF Site and a control sites were carried out between the 4th and 16th October 2013. The second (summer) of four seasonal survey visits were carried out between 10th and 18th January 2014. Two further surveys will be conducted in autumn and winter 2014.

Avifaunal monitoring of the WEF Site comprises a combination of flight activity surveys from various Vantage Points (VPs), as well as walked transects, driven transects, night transects and wetland count surveys. Figure 8.1 shows the survey design and layout on the WEF Site. Large terrestrial species were recorded incidentally in the course of travelling the length of the site en route to survey locations at both the WEF and the control site. A wetland count and night transect was also conducted in the summer survey.

The following definitions apply to the surveys:

- Priority Species - All species occurring on the Avian Sensitivity map list[98];
- Target species per survey method:
  - Flight Activity (Vantage Point) Survey and Incidental Observations: All raptors; all large (non-passerine) priority species; as well as White-breasted Cormorant, African Black Duck, Yellow-billed Duck, Egyptian Goose, Hamerkop, Grey Heron, Glossy Ibis, Namaqua Sandgrouse, South African Shelduck and African Spoonbill;
  - Walked Transects: All birds;
  - Night Driven Transects: All birds; and
  - Wetland Counts: All water-associated birds (waterfowl, piscivorous birds, wading birds, aerial foragers, and aerial divers).

A combined total of 168 species were recorded in and around the WEF Site and control site during the spring and summer surveys. This includes 38 target species, 26 priority species and 23 South African endemic or near endemic species. A total of 9 red listed species have been observed across both surveys, comprising of five species listed regionally as *Vulnerable* and four as *Near Threatened*[99].

Red-listed species recorded during either the spring or the summer surveys include:

- Kori Bustard - listed as *Vulnerable;*
- Ludwig's Bustard - listed as *Vulnerable;*
- Blue Crane - listed as *Vulnerable;*
- Martial Eagle – listed as *Vulnerable;*
- Lesser Kestrel - listed as *Vulnerable;*
- Lanner Falcon - listed as *Near Threatened;*
- Greater Flamingo - listed as *Near Threatened;*
- Black Harrier - listed as *Near-threatened; and*
- Secretarybird - listed as *Near-threatened.*

Table 8.2 presents a summary of the conservation status, priority species score and occurrence in the survey area at the WEF and control site for the 26 priority species

[98] Retief, E, Anderson, M., Diamond, M., Smit, H., Jenkins, A. & Brooks, M. (2011) Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures used.
[99] Barnes, K.N (ed). 2000. The ESKOM Red Data List if Birds of South African, Lesotho and Swaziland. Birdlife South Africa: Johannesburg.

recorded during the spring and summer surveys. Basic analysis of the flight path data has been undertaken for the WEF Site to begin to build a picture of the risk to species recorded. Height bands 2, 3 and 4 considered to be within rotor swept height (RSH). Table 8.2 therefore gives an indication of the number of flights recorded, and what percentage of these were in potential RSH.

As shown by the data at present Verreauxs' Eagle records the largest number of flights, with 69% of those being at potential risk height within the RSH. This currently indicates the locations of flights of Verreauxs' Eagle may be important considerations in the turbine layout/ design process.

Table 8.2: Priority species observed during the spring and summer monitoring surveys.

Species	Species Priority Score[100]	Conservation Status[101]	Occurrence	
			Numbers (High, Medium, Low)	Number of flights and % at RSH across the WEF site only.
Bustard, Kori	280	V	Low	-
Bustard, Ludwig's	320	V	Low	-
Buzzard, Jackal	250	-	Medium	43 (65%)
Buzzard, Steppe	210	-	Low	1 (100%)
Crane, Blue	320	V	Medium	25 (52%)
Eagle-owl, Cape	250	-	Low	1 (0%)
Eagle-owl, Spotted	170	-	Medium	-
Eagle, Booted	230	-	Medium	13 (85%)
Eagle, Martial	330	V	Low	1 (100%)
Eagle, Verreaux's	190	-	High	122 (69%)
Falcon, Amur	210	-	Low	-
Falcon, Lanner	280	NT	Medium	7 (43%)
Fish Eagle, African	290	-	Low	6 (83%)
Flamingo, Greater	290	NT	Medium	4 (0%)
Francolin, Grey-winged	190	-	Medium	-
Goshawk, Southern Pale Chanting	200	-	Low	3 (0%)
Harrier, Black	325	NT	Low	1 (100%)
Harrier-hawk, African	190	-	Low	7 (43%)
Kestrel, Greater	174	-	Low	3 (100%)

[100] Retief, E.F., M Diamond, M.D. Anderson, H.A. Smit, A. Jenkins, M Brooks & R. Simmons 2012. Avian wind farm sensitivity map for South Africa: Criteria and procedures used. Birdlife SA and Endangered Wildlife Trust report. Johannesburg.
[101] Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa: Johannesburg.

Species	Species Priority Score[100]	Conservation Status[101]	Occurrence	
			Numbers (High, Medium, Low)	Number of flights and % at RSH across the WEF site only.
Kestrel, Lesser	284	V	Low	
Kite, Black-shouldered	174	-	Low	4 (100%)
Korhaan, Karoo	190	-	Medium	4 (50%)
Korhaan, Northern Black	180	-	Low	-
Korhaan, Southern Black	200	-	Medium	2 (0%)
Secretarybird	320	NT	Low	5 (100%)
Snake-Eagle, Black-chested	230	-	Low	5 (100%)

CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species.

8.3.2.1 Bird Microhabitats

It is important to understand the habitats available to birds at a smaller spatial scale, i.e., microhabitats. Microhabitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors.

Most of the WEF Site consists of large and relatively flat plains, undulating hills and plateaus covered by karoo scrub vegetation interrupted by steeper slopes that form mesas and buttes and the occasional mountainous area (e.g., the Trouberg).

The mountainous areas, hills and ridges are important habitats for various raptors that may use the slopes for soaring and to gain lift. Rocky outcrops and cliffs may be important nesting habitat for various raptors, most importantly Verreauxs' Eagle, which is likely to spend time hunting along rocky outcrops.

The open grassland and karoo scrub areas are likely to be utilised by birds such as Secretary bird, Blue Crane, Kori Bustard, Ludwig's Bustard and southern Black Korhaan. A variety of raptors will also forage over these open grassy scrub areas, especially Black Harrier, Lanner Falcon and Lesser Kestrel.

Grasses tend to dominate the vegetation on some of the higher mountain tops and plateaus that experience regular frost, rather than typical Karoo scrub.

Other habitats within the WEF Site include farm dams, drainage lines dominated by relatively denser and taller riparian scrub vegetation (e.g., Acacia karoo) as well as rocky outcrops and cliffs. Dams may attract various waterfowl, as well as being potential roosts for Blue Cranes. Drainage lines and rivers may form flyways for a number of bird species including: Ibis; Ducks; Cormorants; Geese and Storks, while riparian scrub will host a number of smaller passerine species.

8.3.3 Grid Connection Site

8.3.3.1 Southern African Bird Atlas Project 1

The SABAP-1 data was collected in QGS, with the Grid Connection Site covering the following squares: 3123DB, 3123DD, 3123DA, 3123DC, 3123CB, and 3123CD. A summary of this data is presented in Table 8.3.

Table 8.3: Raptors and Priority species[102] recorded in the quarter degree squares covering the Grid Connection Site[103].

Species	Status *	Report rate (%) **					
		3123DB	3123DD	3123DA	3123DC	3123CB	3123CD
Total species		91	171	104	161	80	111
Number of cards submitted		5	54	14	31	10	11
Bustard, Kori	V		11	7			
Bustard, Ludwig's	V	20	6		13		18
Buzzard, Jackal	-		65	14	16	20	9
Buzzard, Steppe	-	20	9	7	6		9
Crane, Blue	V		20				9
Eagle, Booted	-				3		
Eagle, Martial	V		11		3		
Eagle, Verreauxs'	-	20	17	14	10		18
Eagle-Owl, Spotted	-		41	7	16		
Falcon, Lanner	NT		19		6	10	
Falcon, Peregrine	NT						9
Fish Eagle, African	-		2		19		9
Flamingo, Greater	NT						
Francolin, Grey-winged	-	40	20	14	13		
Goshawk, Gabar	-		13		10		
Goshawk, Pale Chanting	-	60	67	43	23	60	64
Harrier Hawk, African	-		2				
Harrier, Black	NT		4		3		
Kestrel, Greater	-		9	21	6		9
Kestrel, Lesser	V		11		6		
Kestrel, Rock	-	100	76	29	39	60	55
Kite, Black-shouldered	-		74	14	26	30	36

[102] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

[103] Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. *The atlas of southern African birds*. Vol. 1&2. BirdLife South Africa: Johannesburg.

Species	Status *	Report rate (%) **					
		3123DB	3123DD	3123DA	3123DC	3123CB	3123CD
Korhaan, Black (pre-split)	-	40					
Korhaan, Blue	NT						
Korhaan, Karoo	-	100	52	29	39	30	55
Marsh Harrier, African	V		2				
Owl, Barn	-		7				
Secretarybird	NT		9		3	10	
Stork, Black	NT		17		10	10	
Stork, White	Bonn				3		
Stork, Yellow-billed	NT				3		

** CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species.*

*** Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that these species were recorded in the entire quarter degree square in each case and may not actually have been recorded on the proposed site for this study.*

8.3.3.2 Southern African Bird Atlas Project 2

SABAP-2 data was examined for the pentads (which are roughly 8 km by 8 km squares, and are smaller than the squares used in SABAP-1) in the Grid Connection Site and the WEF Site which had been counted, showing that up to 176 species have been recorded to date (Appendix 8.2), 20 of which are Priority species[104]. In general, the area has been poorly covered by this project to date, and although it is useful to examine this SABAP-2 data to gain a general understanding of the species potentially present in the area, the report rates and abundances should be treated with caution due to the low counting effort across many pentads. Appendix 8.2 shows a combined list of 227 species recorded by both the SABAP-2 and SABAP-1 for the study area which covers the WEF Site and the Grid Connection Site. 31 are Priority species[105], indicating that an additional two Priority species, namely Peregrine Falcon and Yellow-billed Stork, were recorded in the SABAP data for the additional Grid Connection Site. Appendix 8.2 shows report rates, based on the number of cards submitted, for both SABAP projects.

8.3.3.3 Coordinated Waterbird count (CWAC) data

There are no CWAC sites within 60 km of the Grid Connection Site.

8.3.3.4 Important Bird Area project (IBA)

The Grid Connection site is not situated within an IBA and there are no IBAs within 50 km of the Grid Connection Site.

[104] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

[105] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

8.3.3.5 Combined Environmental Impact Assessment for the Proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape

This study, conducted by the CSIR[106], contained an avifaunal chapter authored by Jon Smallie. The study covered large portion of the Grid Connection Site (i.e., the Grid Connection Site passes through the proposed Ishwati WEF site). The avifaunal study included four seasonal surveys across a 12 month period and a total species list of 181 was obtained. Winter surveys recorded the lowest number of species, 96, while the most species, 162 were recorded in spring. Of the total 181 species recorded, 25 Priority species[107] were observed. Importantly however, the following power line collision or electrocution prone species were identified as being at risk and/ or were recorded in relative abundance: Blue Crane; Ludwig's Bustard; Kori Bustard; Karoo Korhaan; Jackal Buzzard; Verreauxs' Eagle and Booted Eagle.

8.3.3.6 Bird Microhabitats

It is anticipated that the available bird micro-habitats will be the same or very similar to those described in section 8.3.2.1 above for the WEF Site. Final confirmation of these will be made following a site visit to the Grid Connection Site, which will be conducted during the EIA phase.

A high level examination of publically available satellite imagery confirms that the Grid Connection Site appears very similar to the WEF Site in terms of land use and vegetation. The avifaunal chapter of the Ishwati Combined EIA identified the following microhabitats on the Ishwati Emoyeni WEF site: rivers and drainage lines; flats or 'vlakte'; ridges/ escarpments; dams; exotic trees, grassy Karoo; and shrub Karoo. The chapter also states that the vegetation on the Ishwati Emoyeni WEF site is classified into two different types: "Eastern Upper Karoo", which covers most of the area and "Upper Karoo Hardeveld"[108]. The chapter concludes generally that, in this short vegetation type and open landscape large terrestrial bird species and raptors are expected to be the most important species.

8.4 Potential Impacts and Mitigation

After collation of the baseline data using the methods set out in section 8.2, the potential impacts of the Proposed Development on avifauna resources were identified, for the construction, operational and decommissioning phases.

The key potential impacts arising from the Proposed Development include:

- Collision with turbines;
- Electrocution from power lines[109] ,[110,111];
- Collision with power lines [112,113];

[106] Council for Scientific and Industrial Research (CSIR), 2014. Combined Environmental Impact Assessment for the Proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape.

[107] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

[108] Mucina & Rutherford. 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

[109] Verdoorn, G.H. 1996. Mortality of Cape Griffons Gyps coprotheres and African Whitebacked Vultures Pseudogyps africanus on 88kV and 132kV power lines in Western Transvaal, South Africa, and mitigation measures to prevent future problems. (2nd International Conference on Raptors: 2-5 October 1996. Urbino, Italy.)

[110] Kruger, R. 1999. *Towards solving raptor electrocutions on Eskom Distribution Structures in South Africa*. M. Phil. Mini-thesis. University of the Orange Free State. Bloemfontein. South Africa.

[111] Van Rooyen, C.S. 2000. "An overview of Vulture Electrocutions in South Africa." *Vulture News,* 43, pp 5-22. Vulture Study Group: Johannesburg, South Africa.

- Habitat destruction; and
- Disturbance and Displacement.

These impacts will be assessed for their significance during the EIA phase, and after all pre-construction monitoring has been completed.

8.4.1 Construction Phase

8.4.1.1 Habitat Destruction

Associated with the construction of access roads and the clearing of servitudes, as well as clearing vegetation at substation sites and turbine locations. These activities may result in the permanent loss of important habitats for birds and may have an impact on birds breeding, foraging and roosting in or in close proximity of the site through modification of habitat.

8.4.1.2 Disturbance and Displacement

Similarly, the above mentioned construction activities may impact on birds through disturbance, particularly during bird breeding activities. This may result in birds being displaced due to the presence of staff and construction activities.

8.4.2 Operational Phase - WEF site

8.4.2.1 Wind Turbine Collisions

WEFs can have adverse impacts on avifauna through the collision of birds with moving turbine blades. A number of factors influence the number of birds impacted by collision, including:

- Number of birds in the vicinity of the WEF;
- The species of bird present and their flying patterns and behaviour;
- The design of the development including the turbine layout, height and size of the RSH.

It is important to understand that not all birds that fly through the WEF at heights swept by rotors automatically collide with blades. In fact avoidance rates for certain species have proven to be extremely high. In a radar study of the movement of ducks and geese in the vicinity of an off-shore wind facility in Denmark, less than 1% of bird flights were close enough to the turbines to be at risk, and it was clear that the birds avoided the turbines effectively[114]. Whilst avoidance rates for many SA species are currently unknown from an operational monitoring perspective, comparisons can be drawn with some species, for example Verreaux's eagle with Golden Eagle, in order to inform an assessment.

Landscape features can influence flight and behaviour. Elevation, ridges and slopes are all important factors in determining the extent to which an area is used by birds in flight. Bird flight behaviour may also influenced by wind direction and speed.

Collisions with turbines present a potential significant direct impact on avifuana and will form a key component of the assessment during the EIA phase.

[112] Ledger, J. 1983. *Guidelines for Dealing with Bird Problems of Transmission Lines and Towers*. Eskom Test and Research Division Technical Note TRR/N83/005.
[113] Van Rooyen, C.S. & Ledger, J.A. 1999. "Birds and utility structures: Developments in southern Africa" in Ferrer, M. & G..F.M. Janns. (eds.) *Birds and Power lines*. Quercus: Madrid, Spain, pp 205-230
[114] Desholm & Kahlert, 2005. Avian collision risk at an offshore wind farm. Available online: http://rsbl.royalsocietypublishing.org/content/1/3/296.full Accessed 17/06/2014

8.4.2.2 Power Line Collisions

Collisions with power lines are currently are the biggest single threat posed by over-head power lines to birds in southern Africa[115]. In general, large lines with earth wires that are not always visible to birds can have the largest impact in terms of collisions. Most heavily impacted upon are korhaans, bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines[116,117]. Many of the collision sensitive species are considered threatened in southern Africa. The Red Data[118] species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require specific conditions for breeding.

8.4.2.3 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen, 2004). Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks [119].

8.4.2.4 Disturbance and Displacement

An operational WEF will normally have various day to day activities, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing. These activities may impact on birds through disturbance, particularly during bird breeding activities. This may result in birds being displaced from the WEF Site.

8.4.3 Operational Phase - Grid Connection site

8.4.3.1 Electrocutions

The threat regarding electrocution is as reported above for the WEF with regard to the power line component of the Proposed Development however due to the potentially higher voltage of the power line there is potential to effects different species.

8.4.3.2 Power-line Collisions

The threat regarding power line collisions is as reported above for the WEF with regard to the grid connection component of the Proposed Development.

8.4.3.3 Disturbance and Displacement

Human presence as well as routine operational and maintenance activities can impact on birds through disturbance, particularly during bird breeding activities. These activities on

[115] Van Rooyen, C.S. 2004. Investigations into vulture electrocutions on the Edwardsdam-Mareetsane 88kV feeder, Unpublished report, Endangered Wildlife Trust, Johannesburg.
[116] Van Rooyen, C.S. 2004. Investigations into vulture electrocutions on the Edwardsdam-Mareetsane 88kV feeder, Unpublished report, Endangered Wildlife Trust, Johannesburg.
[117] Anderson, M.D. 2001. The effectiveness of two different marking devices to reduce large terrestrial bird collisions with overhead electricity cables in the eastern Karoo, South Africa. Draft report to Eskom Resources and Strategy Division. Johannesburg. South Africa.
[118] Barnes, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa: Johannesburg.
[119] Van Rooyen, C.S. 2004. Investigations into vulture electrocutions on the Edwardsdam-Mareetsane 88kV feeder, Unpublished report, Endangered Wildlife Trust, Johannesburg.

the grid connection site may include (but are not limited to) grass and bush clearing of servitudes, as well as repair work on the power lines and towers.

8.4.4 Decommissioning Phase

The anticipated impacts predicted during the decommissioning phase are similar to those predicted during the construction phase, as set out in section 8.4.1, albeit to a lesser extent, and are largely associated with disturbance and displacement caused by decommissioning activities. There is the potential for re-vegetation of areas once infrastructure has been removed, which, in time, may have a positive impact on avifauna.

8.5 Relevant Stakeholders/ Consultees

During the final seasonal survey of the WEF Site (scheduled for July 2014), investigation will be done as to the existence of any local bird clubs or interested bird watchers in the Murraysburg area. These stakeholders will then be consulted accordingly.

BirdlifeSA have already been consulted in relation to the Proposed WEF and have been provided with copies of the progress reports from the surveying to date.

8.6 Assessment Methods

Assessment of potential effects on avifaunal interests will be made through the following stages:

- Describing the avifaunal baseline through survey and desk study;
- Determining the value of the avifaunal receptors. This will be done primarily though the compilation of a list of focal species by considering factors such as abundance, behaviour on site, breeding and flight activity (*i.e.*., by considering the survey results) as well as Priority Species status[120].), red-list status[121] and whether the species is endemic or not;
- Identifying and characterising the potential effects on the focal species. Potential avifaunal effects will be described by their Magnitude, Extent, Duration, Reversibility, Timing and Frequency, and Direction of Change. One or more of these variables will be assessed in light of a receptor's baseline condition and with regard to its sensitivity;
- Determining the significance of effects in the absence of mitigation;
- Assessment of the potential cumulative effects of the components of the Proposed Development both with each other, and other proposed grid infrastructure and WEF developments in the region;
- Describing mitigation, compensation, enhancement and monitoring measures associated with the Proposed Development; and
- Any significant effects remaining after mitigation ('residual effects') are the factors to be considered against legislation, policy and development control in determining the application.

Collision risk modelling, if required, will follow the method presented by Band *et al.* (2007)[122].

[120] Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.

[121] Taylor, M.R. (ed.) 2014. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg. In press.

[122] Band, W., Madders, M. and Whitfield, D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Janss, G. and Ferrer, M. (eds.) Birds and Wind Power. Quercus, Madrid

9 SOILS AND AGRICULTURE

9.1 Introduction

Terra Soil Science (TSS) has been commissioned to provide specialists services in relation to potential impacts on soil, land use, land capability and agriculture arising from the Proposed Development.

9.2 Desk Based Baseline Methods

To date, desk based baseline data (covering soil, land capability, land use and agricultural potential) have been collated to obtain information in the following three phases:

- Phase 1: Topography - The topography of the WEF Site was determined from 20 m contour data, from which a digital elevation model (DEM) was generated (Figure 9.1). From this data, a slope map and a topographic wetness index (TWI) map was generated (Figure 9.3). The TWI map indicates areas of concentrated water flows and therefore correlates with drainage features;
- Phase 2: Land Use/ Type - Land type data was obtained from the Institute for Soil Climate and Water of the Agricultural Research Council[123]. The land type data is presented at a scale of 1:250,000 and entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System[124]. The soil data was interpreted and re-classified according to the Taxonomic System[125]. Land capability classification data was also taken into consideration and
- Phase 3: Aerial Photograph Interpretation and Land Use Mapping - The most up to date aerial photographs of the site were obtained from Google Earth. The images were used to interpret aspects such as land use and land cover as well as historic land uses such as cultivation.

This data has been used to compile this section of the Draft Scoping Report. A site visit will be undertaken during the EIA phase by TSS to add to this desk based information, verify its content and feed into the design process and assessment of impacts.

9.3 Baseline Environment

The Proposed Development Site lies on hilly terrain with numerous ephemeral and seasonal drainage features. The altitude varies between 1200 m and 1900 m above mean sea level from west to east. The geology is dominated by mudstone, shale and sandstone with numerous dolerite intrusions.

9.3.1 Topography

The DEM for the WEF Site is provided in Figure 9.1 and on Figure 9.7 for the Grid Connection Site, the slope maps are presented in Figure 9.2 and 9.8, and the TWI maps in Figures 9.3 and 9.9. The drainage features indicated on this map correlate with areas of deposition and erosion with deeper soils.

[123] Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information Systems available at http://agis.agric.za (accessed 17th June 2014).
[124] MACVICAR, C.N. et al. 1977. *Soil Classification. A binomial system for South Africa.* Sci. Bull. 390. Dep. Agric. Tech. Serv., Repub. S. Afr., Pretoria.
[125] Soil Classification Working Group. 1991. Soil Classification. A taxonomic system for South Africa. *Mem. Agric. Nat. Resour. S.Afr. No.15.* Pretoria.

9.3.2 Land Use / Type

A land type maps is provided in Figures 9.4.

The site falls predominantly into the Fc131 and Da147 land types with the Fb488, Fc402, Ia94, Ib126, Ib262 and Ib397 land types having a limited occurrence[126].

A brief description of the land types, in terms of soils, land capability, land use and agricultural potential, follows:

9.3.2.1 Land Type Fc131

Land Type: Fc land types denote areas that are dominated by pedologically[127] young landscapes with lithocutanic B[128] horizons and lime in all landscape positions.

Soils: Mainly shallow and rocky soils in upland and midslope positions with a variety of structured to apedal soils of moderate to shallow depth in footslope and valley bottom positions – most containing lime. Duplex and pedologically young soils dominate in these positions with the exception of dolerite outcrops where more stable structured soils occur.

Land capability and land use: Land use is limited to extensive sheep grazing with small occurrences of crop production in alluvial deposits in drainage features. The land capability mimics the land use.

Agricultural potential: The agricultural potential is linked to the soil depth and the bulk of the land type is therefore of low to very low crop production potential (land capability classes VII and VIII). The soils are suited to extensive grazing only as the soils are shallow and the rainfall is low (around 300 mm per year – Figure 9.5) and erratic.

9.3.2.2 Land Type Da147

Land Type: Da land types denote areas where duplex soils with red B horizons dominate.

Soils: Mainly variable depth duplex soils throughout the landscape with hills being dominated by rocky soils and rock outcrops.

Land capability and land use: Land use is limited to extensive sheep grazing with small occurrences of crop production in alluvial deposits in drainage features. The land capability mimics the land use.

Agricultural potential: The agricultural potential is linked to the soil depth and the bulk of the land type is therefore of low crop production potential (land capability classes VII and VIII). The soils are suited to extensive grazing only due the low and erratic rainfall (around 300 mm per year). Irrigated crop production is possible where adequate water resources are available but these land uses require very intensive management in duplex soil environments.

9.3.2.3 Land Type Fc402

The Fc402 land type is similar to the Fc131 land type with the difference that structured soils dominate throughout.

[126] LAND TYPE SURVEY STAFF. (1972 – 2006). Land Types of South Africa: Digital map (1:250 000 scale) and soil inventory databases. ARC-Institute for Soil, Climate and Water, Pretoria.
[127] Pedology is the study of soils.
[128] Lithocutanic B is a specific type of soil (Soils of South Africa, Fey. M 2010)

9.3.2.4 Land Type Ia94

Soils: Mainly pedologically young soils derived from alluvium in footslope and valley bottom positions. Lime occurs throughout.

Land capability and land use: Land use ranges from grazing through dryland agriculture to irrigated agriculture.

Agricultural potential: The agricultural potential is linked to the soil depth and large areas are of high potential in the presence of water. In the absence of irrigation water the potential is low and then limited to extensive grazing. Dryland crop production is not possible as the rainfall is too low: in the region of 300 mm per year (Figure 9.5).

9.3.2.5 Land Types Ib126, Ib262 and Ib262

Soils: Almost exclusively shallow and rocky soils with rock outcrops due to undulating and hilly topography. A range of soils occur to a limited extent in depressions and flatter areas.

Land capability and land use: Land use is limited to extensive grazing.

Agricultural potential: The agricultural potential is very low and limited to extensive grazing sheep production (land capability classes VII and VIII). This is due to the shallow and rocky soils as well as the low rainfall (Figure 9.5).

9.3.3 Aerial Photograph Interpretation and Land Use/Capability Mapping

The interpretation of the Google Earth images yielded one main land use namely extensive grazing (see Figure 9.6). Irrigated crop production occurs to a very limited extent on the survey site in alluvial depressions along some of the drainage features. This land use occurs more extensively to the south outside of the survey area.

9.3.4 Interpretation of Results

9.3.4.1 Agricultural Potential

The dryland agricultural potential of the WEF Site is very low due to the shallow soils and low rainfall. Irrigated agriculture is practiced along a limited number of drainage lines if the alluvial soils are deep enough with adequate drainage. There is extensive grazing of sheep and as such the agricultural potential is determined by grazing potential and stocking rates, with the soils on the WEF Site being sensitive to overgrazing.

9.3.4.2 Overall Soil Impacts

The overall impacts of the WEF is likely to be low due to the low quality baseline of agricultural potential of soils on the WEF Site. Impacts that have to be managed are soil erosion, arising from infrastructure development, as well as storm water runoff from the new infrastructure (this is addressed in Section 5.4 of this DSR).

The soils and agriculture constraints will be fed into the design process so as to minimise the impacts of the Proposed Development through embedded mitigation.

9.4 Potential Impacts and Mitigation

The following construction impacts could occur in relation to soils and agriculture and will be assessed during the EIA phase:

9.4.1 Physical Soil Disturbance

9.4.1.1 Nature of Impact

Direct impacts are associated with the soils along the constructed roads as well as on the turbine construction sites being disturbed or removed during construction activities. Indirect impacts could arise in the form of soil erosion and degradation if storm water management is not planned and managed appropriately as it is generated on the roads and construction sites. Cumulative negative impacts are considered to be improbable due to the low agricultural potential of the soils on the Proposed Development Site.

9.4.1.2 Extent of Impact

The extent of this impact will be local in terms of the activity and will be associated with the activity only. Slightly larger, but still local in extent, impacts are expected if storm water runoff is not controlled.

9.4.1.3 Potentially Significant Impacts to be Assessed in EIA Phase

The potentially significant impacts to be assessed in the EIA phase will be limited to the classification of the soils as well as assessment of slopes and storm water impacts. These parameters will provide an indication to the project engineers regarding the erosion risk as well as informing the mitigation and management measures to be implemented through the EMP.

9.4.2 Impacts on Current Land Use

The current land use consists of extensive grazing with very limited areas of crop production.

9.4.2.1 Nature of Impact

Direct impacts are associated with the constructed roads as well as the turbine construction sites which would remove the current land use from these areas of the WEF Site. Indirect impacts could also arise in the form of land use changes due to soil erosion and degradation if storm water management is not planned and managed properly as it is generated on the roads and construction sites. Cumulative negative impacts are considered to be improbable due to the low agricultural potential of the soils on the Proposed Development Site.

9.4.2.2 Extent of Impact

The extent of this impact will be local in terms of the activity and will be associated with the activity only. Slightly larger, but still local in extent, impacts are expected if storm water runoff is not controlled.

9.4.2.3 Potentially Significant Impacts to be Assessed in EIA Phase

The potentially significant impacts to be assessed in the EIA phase will be limited to the determination of, in a broad sense, the yield potential and averages as well as carrying capacity of the site in general and specific sections of the Proposed Development Site.

9.4.3 Impacts on Agricultural Potential

The agricultural potential of the WEF Site is low due to the low and erratic rainfall and shallow soils.

9.4.3.1 Nature of Impact

Direct impacts would be the destruction of agricultural potential from construction of new facilities on the site, although the potential for this impact is considered to be low due to the low agricultural potential of the Proposed Development Site. Significant indirect and/or cumulative impacts are not considered probable due to the low potential on the Proposed Development Site and hence are scoped out of the EIA.

9.4.3.2 Extent of Impact

The extent of this impact will be local in terms of the activity and will be associated with the activity only. Slightly larger, but still local in extent, impacts are expected if storm water runoff is not controlled. The impacts are considered to be low due to the low agricultural potential baseline of the Proposed Development Site.

9.4.3.3 Potentially Significant Impacts to be Assessed in EIA Phase

The potentially significant impacts to be assessed in the EIA phase will be limited to the determination of the agricultural potential of the soils as well as the probability that they will be impacted.

9.5 Relevant Stakeholders/ Consultees

The Department of Agriculture Forestry and Fisheries (DAFF) is a key consultee for the EIA of soils and agriculture. DAFF have already commented on the submission of the application forms for the Proposed Development.

It is acknowledged that the letter issued by the DEA in response to the application forms (Appendix 1.2) contained a request from the DAFF for a detailed study of the WEF Site at the 1:10,000 scale. Given the scale of the WEF Site and the fact the footprint will only occupy a small amount of the total area, it is proposed to first undertake a higher level site based assessment which will feed into the design process within the EIA whereby the layout of the WEF is planned within the entire WEF Site.

This will allow sensitive areas of soils with high potential for agricultural land to be identified and these findings incorporated into the design. It is proposed then that as a condition of the EMP, should environmental authorisation be granted, that a further detailed study be undertaken at a finer scale in relation to the known footprint of the development and this information supplied and submitted to the DEA and DAFF for comment and review, prior to the commencement of construction of the Proposed Development. This approach will be discussed with DAFF throughout the EIA phase and has informed the scope of the EIA presented below.

The Murraysburg Farmers Association and Murraysburg Farmers' Co-operative will also be consulted regarding the Proposed Development.

9.6 Assessment Methods

Based on the desk study findings so far, it is considered that the Proposed Development of will have low impacts due to the small scale footprint of the grid connection, which has been scoped out of further assessment, and the low potential agricultural baseline of the soils within the Proposed Development Site. The current land use is limited to extensive grazing due to the restrictions posed by the soils and the climate.

This will be confirmed during the soil survey and site visit carried out as part of the EIA phase. A site visit will be conducted which will investigate further the following parameters within the Proposed Development Site:

- Soil distribution (classification);

- Extent of degradation due to current land use (such as overgrazing);
- Erosion status and erodibility of the soils; and
- Mitigation measures to minimise impacts associated with the Proposed Development Site.

As with all the specialist assessments, as part of the EIA process the information will be used in order to assess the likely impacts of the Proposed Development, and where practicable, suggest mitigation measures to reduce or remediate these impacts. The process for this is summarised as:

- Establishment of the soils and agricultural baseline utilising desk based information (contained in this Draft Scoping Report);
- Undertaking a site visit in order to survey the Proposed Development Site to verify the desk based information and provide further site specific information to support the design of the Proposed Development so as to minimise adverse impacts through embedded mitigation;
- An assessment of the impacts of the Proposed Development in light of the proposed design incorporating the embedded mitigation noted above and control measures which will be implemented through the EMP. The assessment will utilise a methodology as outlined in Section 1.2.5 of this report;
- Where impacts are found to be unacceptable further mitigation measures will be considered in order to minimise these impacts; and
- Reporting of the residual impact of the Proposed Development following the application of the embedded mitigation, further mitigation measures and the content of the EMP.

10 CULTURAL HERITAGE, ARCHAEOLOGY AND PALAEONTOLOGY

10.1 Introduction

ACO Associates CC has been commissioned to provide specialists services in relation to potential heritage, archaeology and palaeontology impacts arising from the Proposed Development. This section of the Draft Scoping Report is conducted under section 38.8 of the National Heritage Resources Act (NHRA) of 1999[129], as part of an EIA.

This section of the Draft Scoping Report identifies the different kinds of heritage, archaeology and palaeontology that can be expected at the Proposed Development Site (i.e., the baseline), and then identifies the potential impacts which might occur as a result of the Proposed Development. It provides an indication (based on professional judgement and previous experience) of how heritage resources will be affected and provides preliminary indications as to how successful mitigation can be achieved.

Areas or issues which are likely to be significant constraints to the Proposed Development will also be identified, as will areas which are suitable for the Proposed Development, with regard to heritage, archaeology and palaeontology resources.

10.2 Baseline Survey Methods

10.2.1 Desk Study

ACO Associates CC has worked on a number of projects close to the Proposed Development Site including the Perseus-Gamma 765 kV electricity transmission line route for Eskom Holdings SOC Ltd, and the adjacent Ishwati Emoyeni WEF heritage impact assessment. The ACO Associates CC author of this report was based in the area during his employment on the Zeekoe Valley Archaeological Project (ZVAP) and as such this Draft Scoping Report section is based on extensive local experience and a good knowledge and understanding of the area's heritage.

A desk-based study has been undertaken via a literature review, and the findings of this are reported in Section 10.3, below.

10.2.2 Field Survey

A site based survey will be undertaken at the EIA phase to build on the desk based information presented in this Draft Scoping Report. In addition, based on the findings of the desk study, it is considered important that a field assessment of the paleontological sensitivity of the Proposed Development Site is undertaken. These have been planned for the EIA phase.

10.2.2.1 Survey Methods

Basic standards for surveys are supplied by the Association of Southern African Professional Archaeologists. Heritage authorities recognise these standards but most have not made them legal regulations. The Association of Professional Heritage Practitioners Western Cape has contributed to standardising assessment methods. Heritage Western Cape has indicated that they do intend to publish regulations in the future, but request that surveys and resulting reports are in line with a number of guidelines that they have made known through the professional associations.

The physical surveying of a landscape by both palaeontologists and archaeologists involve visiting the project area and surveying as many of the different kinds of environment as

[129] National Heritage Resources Act 1999. Available online: http://www.unesco.org/culture/natlaws/media/pdf/southafrica/za_natheritagresources1999_engorof.pdf Accessed 17/06/2014

possible. Given the size of the Proposed Development Site it is not possible to conduct a saturation survey of the whole area. Instead, a stratified sampling method will be applied which will see a variety of landscape types searched including: ridge tops, riverine areas, areas close to springs, rocky overhangs and shelters and flat plains. Palaeontologists look for places where rock is exposed such as cuttings, erosion areas and riverbeds that cut into the Karoo shales.

The surveys will focus on the Proposed Development Site, however heritage sites or places outside of the Proposed Development Site that may be indirectly impacted, will need to be inspected and the impact of the proposed activity assessed. The kinds of heritage that will be assessed are guided by (but not limited to) the general protections contained within the NHRA.

10.2.2.2 Consultation during fieldwork

Much anecdotal evidence can be obtained from discussions with the local community as they have knowledge about the individual histories of farms, location of ruins and graveyards or Boer War skirmish sites. Likewise community museums and heritage organisations (if they exist) can provide useful information. The above consultation will be carried out and used to inform the assessment.

The basis for assessment of impacts to heritage is the NHRA, which in turn prescribes the manner in which heritage is assessed and managed. The NHRA has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of aesthetic or 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 38 of the NHRA stipulates that Heritage Impact Assessments are required for certain kinds of development such as rezoning of land greater than 10,000 m^2 in extent or exceeding 3 or more sub-divisions, linear developments in excess of 300 m or for any activity that will alter the character or landscape of a site greater than 5,000 m^2.

10.2.2.3 Cultural Landscapes (places of cultural significance)

Section 3(3) of the NHRA, No 25 of 1999 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.

10.2.2.4 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised as a category of heritage resources. In the DEADP (Western Cape) guidelines for involving heritage specialists in the EIA process (Baumann and Winter, 2005[130]) comment that the visual intrusion of development on a scenic route should be considered a heritage issue.

10.2.2.5 Heritage Grading

A key tool in the assessment of heritage resources is the heritage grading system which uses standard criteria. In the context of an EIA process, heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIAs (Table 10.1). The system is also used internally within Heritage Authorities around the country for making decisions about the future of heritage places, buildings and artefacts.

Table 10.1: Grading of Heritage Resources (Source: Winter and Baumann, 2005).

Grade	Level of Significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e., formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e., formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e., formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e., potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e., potential Grade 3C heritage resources.

Heritage specialists use the grading system to express the relative significance of a heritage resource. This is known as a field grading or a recommended grading. Official grading is done by a committee of the relevant heritage authority, however heritage authorities rely extensively on field grading in terms of decision making.

[130] Winter, S. & Baumann, N. 2005. Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

10.3 Baseline Environment

10.3.1 Availability of Literature

The Proposed Development Site lies approximately 26 km from the ZVAP survey area, a project initiated by Professor Garth Sampson of Southern Methodist University which has been running from the late 1970s to the present day. The study has involved a saturation survey of some 5,000 km^2 of Karoo landscape and resulted in numerous dissertations, monographs and papers. Given the similarity and proximity of the ZVAP to the Proposed Development Site, these publications are directly relevant (papers by Sampson *et al.*, 1989-2010[131]).

With regards to palaeontology, the Proposed Development Site lies within some of the richest paleontological sequences in the Great Karoo. The Beaufort Group contains the richest sequence of early mammal-like reptiles known to date. Information in the form of published academic books and papers are widely available.

10.3.2 Physical Characteristics

Much of the Eastern and Western Cape Provinces as well as the southern part of the Free State are known as the Karoo. The Karoo was once home to many groups of pre-colonial people and vast herds of game.

The geology and palaeontology of the region has been a subject of research since the early 20th century. The flat plains of the Nama Karoo are underlain by a series of shale and mudstone strata which represent some 400 million years of depositional events (Visser, 1985[132]). The basal rocks of the Karoo sequence are known as the Dwyka formation which was deposited by a wet based glacier during the Permo-Carboniferous glaciation. This was followed by the deposition of the Ecca formation which is made up of sediments deposited in a shallow lake that covered what is now the interior of Southern Africa. Ecca shales form many of the large flat plains of the Northern Karoo (Truswell, 1977[133]; Tankard *et al.*,[134] 1982; Visser, 1985). The best known depositional event of the Karoo sequence is the laying down of the Beaufort shales about 230 million years ago. These shales are rich in a stratified sequence of fish, reptilian and amphibian remains that lie fossilized in Permian and Triassic period swamp deposits (Truswell, 1977; Visser, 1985; Oelofsen and Loock, 1987[135]). At the end of the Triassic period a series of geological upheavals took place with the fragmentation of the Gondwanaland continent. These were largely responsible for giving the Karoo its characteristic landscape. Triassic period volcanic activity took place over an extended period of time beginning at 187

[131] SAMPSON, C HART, T WALLSMITH, D, AND BLAGG J.D. 1989. The ceramic sequence in the upper Seacow Valley: problems and implications. South African Archaeological Bulletin 44. 3-16.

SAMPSON, C.G. 1988. Stylistic Boundaries among Mobile Hunter-Foragers. Washington: Smithsonian Institution Press.

SAMPSON, CG 2008. Chronology and dynamics of Later Stone Age herders in the upper Seacow River valley, South Africa

SAMPSON, CG. 2010 Chronology and dynamics of Later Stone Age herders in the upper Seacow River valley, South Africa. Department of Anthropology, Texas State University, San

SAMPSON, CG., SAMPSON, B. AND NEVILLE, D. 1994 The Frontier Wagon Track System in the Seacow River Valley, North-Eastern Karoo. The South African Archaeological Bulletin, Vol. 49, No. 160 (Dec., 1994), pp. 65-72.

[132] VISSER, J.N.J. 1985. The Dwyka Formation along the north-western margin of the Karoo Basin in the Cape Province, South Africa. Transactions of the Geological Society of South Africa 88, 37-48.

[133] TRUSWELL, J.F. 1977. The geological evolution of South Africa. Cape Town: Purnell.

[134] TANKARD, J.A., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAY, D.K., HUNTER, D.R., MINTER, W.E.L. 1982. Crustal evolution of South Africa. New York: Springer-Verlag.

[135] OELOFSEN, B.W. , LOOCK, J.C. 1987. Paleontology. In Cowling, R.M. & Roux, P.W. (eds). The Karoo biome: a preliminary synthesis - vegetation and history. South African National Scientific Programmes Report No 142: 102-116. Pretoria: CSIR

million years ago (Truswell, 1977). During this time the horizontal volcanics of the Drakensberg were laid down and the shales of the Karoo were penetrated by dolerite intrusions and extrusions in the form of vertical dykes and horizontal sills following the bedding planes of the shales. These geological structures give rise to a very characteristic topography with general occurrences of mesas, hillocks and sharp ridges (Visser, 1985). In the Proposed Development Site, extruding dolerite dykes and hillocks exposed through differential erosion are dominant features of the landscape, giving rise to the vast flat plains of mudstones dolerite outcrops and hills that are so characteristic of this area. These igneous events resulted in the formation of Hornfels, a fine grained black rock with a conchoidal fracture. Hornfels is formed when a dolerite intrusion takes place and bakes the surrounding mudstone to a metamorphic form (Visser, 1986). Prehistoric peoples exploited Hornfels exposures for raw material for making artefacts.

The Karoo geology gives rise to numerous aquifers and fountains which has effectively made this land viable farming country, as grazing land for herbivores. By the same token the land was habitable for prehistoric people and animals. Ground water in the Great Karoo is usually associated with dolerite dykes and to a lesser extent, sills. Cracks in the Karoo shales along dolerite intrusions serve as aquifers which get topped up by seasonal rains. Intensive borehole pumping and donga formation has lowered the water table in historic times. Many natural fountains no longer flow because of this.

10.3.3 Paleontological Sensitivity

The Great Karoo is described in literature as an important repository of paleontological information about the evolution of both marine and terrestrial plants and animals.

The Karoo Supergroup is the largest stratigraphic unit in Southern Africa, covering almost two thirds of the present land surface extending from the Western Cape to central Africa. The basins in which it was deposited formed during the formation and breakup of Pangea (Rubidge, 2005[136]).

Its strata, mostly shales and sandstones, record an almost continuous sequence of marine glacial to terrestrial sedimentation from the permo-carboniferous to the early Jurassic, a period of about a hundred million years. These accumulated in a shallow inland sea basin now called the “main Karoo Basin”. This basin was formed by the subduction of the palaeo-Pacific plate and the development of mountain ranges round the fringes of the Ecca sea where material eroding from the mountains drained into this shallow sea creating the layers of sediments that eventually formed the shales of the Karoo. The sediments of the Karoo supergroup attain a maximum cumulative thickness of 12 km, with the overlying basaltic lavas (the Drakensberg Group) at least 1.4 km thick (Smith, 1990[137]).

Fossils include plants (both macro-fossils and pollen), rare insects and fish, common and diverse tetrapods (mostly therapsid reptiles, temnospondylamphibians, and in the upper strata dinosaurs) and ichnofossils. This massive paleontological resource has and continues to make a substantive contribution to understanding the evolutionary process of life on earth (Rubidge, 2005, Almond and Pether, 2008[138], Benton, 2009[139]).

[136] Rubidge, B. 2005. Du Toit Memorial Lecture Re-uniting lost continents – Fossil reptiles from the ancient Karoo and their wanderlust. South African Geological Society. Vol 108 no 1.
[137] Smith, R.H.M. 1990. A review of stratigraphy and sedimentary Environments of the Karoo Basin of South Africa. Journal of African Earth Sciences (and the Middle East). Vol 10 1-2.
[138] Almond, J and Pether, J 2008. Palaeontological Heritage of the Western Cape. Unpublished technical report prepared for heritage management purposes.
[139] Benton, M.J. 2009. Vertebrate Palaeontology. Oxford: Blackwell Publishing.

The distribution of fossils in and around the Proposed Development Site is not particularly predictable – fossils may occur in clusters or as single isolated finds. The Proposed Development Site falls with a "red zone" according to the South African Heritage Resources Information System (SAHRIS)[140] fossil sensitivity overlay. This indicates that, according to research to date and the geology of the Proposed Development Site, there is a strong possibility that fossil material will be present at the Proposed Development Site.

10.3.4 Pre-history and History of the Proposed Development Site

The Karoo has been occupied by people from the Early Stone Age (more than a million years ago), the Middle Stone Age (advent of archaic modern humans) to the Later Stone Age when ancestors of the San (bushman) and the Khoekhoen occupied the entire Karoo basin.

In 1812 William Burchell crossed into the Great Karoo on his journey to the border of the colony from the Kuruman district. He was the last person to encounter the last free groups of indigenous people. He travelled over many miles of Karoo and wrote one of the most detailed accounts available. Burchell makes mention of people he met while on his journey from the Orange River to the colony. The Khoekhoen group, the "Koras" (sometimes known as the Koranas) were at that time, encamped along the banks of the Orange River (Burchell, 1922[141]; Vii:6-7) where they were keeping cattle and sheep. 'Bushmen' were only seen in the central Karoo. Burchell made contact with these people with the help of Riizo, a half bushman whose kraal lay close to the confluence of the Orange and Brak rivers (Vii:13). Burchell, with Riizo acting as an interpreter, was joined by Kaabi, a bushman, who eventually led Burchell to a kraal of some people that he knew. Burchell took this as an act of friendship as the 'Bushmen' concealed the position of their kraals from the colonists. The kraal was situated on the summit of a ridge and consisted of "half a dozen wretched worn huts" (Burchell, 1822; Vii:27). This kraal, according to Burchell, was a melancholy picture of poverty which inspired him to depart with liberal quantities of tobacco and meat. By the beginning of the 19th century the San who had occupied the Karoo for no less than 20,000 years or more, had been decimated.

The demise of the indigenous peoples of the Karoo came with the advent of European farmers. In 1770 a terrorist war lasting some 40 years began. Reports came back to the Cape that the colonists were being raided by San who were making forays from places of refuge in the mountains such as the Sneeubergs and Groot Winterhoek Mountains onto farms (Van der Merwe 1935). By 1774 the situation became so serious that many of the trekboer farmers of the Eastern Karoo were abandoning their farms. Calls for assistance were made to the Cape, while on the war front intensified kommando activity began to take place. The kommando was an informal detachment of freeburgers and armed Hottentots who actively hunted out the marauding San with the blessing of the government. The notorious actions of the veld cornet Adriaan van Jaarsveld resulted in the slaying of scores of San with 120 people being killed in a single incident (Moodie, 1838; viii: 43). Accounts in Moodie's Record (1838) indicate that the colonists were facing a united front of unprecedented San resistance in 1776. In 1777 legislation passed at the Cape opened the way for the formal annihilation of the San. By the time that Burchell had passed through the region in 1812, very few San were seen.

The formal granting of farms to wandering trekboers saw the vast landscapes of the Karoo partitioned in 5,000 morgen allocations (Sampson, Sampson and Neville, 1994). These were situated close to fountains and in the best grazing land. Indigenous people were increasingly marginalised onto the few remaining patches of as yet unclaimed land.

[140] South African Heritage Resources Information System. Available online http://www.sahra.org.za/sahris (Accessed 19th June 2014)
[141] BURCHELL, W.J. 1822-24. Travels in the interior of Southern Africa. V 1 & 2. Reprinted facimile 1967. Cape Town: struik

Deprived of the ability to hunt (by the early 1800s the game herds had been shot out) and with traditional social structures disrupted they had little choice but to seek work on farms or settle at mission stations established for their emancipation (Sampson, Sampson and Neville, 1994). A life-style thousands of years old ended, however the archaeological heritage that has survived is prolific and manifested in the form of thousands of archaeological sites.

Today the central Karoo is almost entirely given over to small stock and game farming. Overgrazing since the advent of formal farming in the 19th century has caused some changes to the landscape in terms of the composition of vegetation. Acocks (1953) has claimed that pure grass veld gave way to Karoo scrub only after livestock was introduced, however it is apparent that rainfall fluctuation does cause seasonal and even cyclical oscillations with respect to prevalence of Karoo scrub versus grasslands.

Overall, the damage caused by modern surface development has been slight. To all intents and purposes the Karoo has the qualities of an intact natural area. In areas transformation has taken place, sheet erosion and donga formation has had an impact, the scattered towns and farms represent a comparatively ephemeral imposition of the landscape of colonial settlement. Aside from these comparatively moderate interventions the Karoo remains dominated by its wilderness qualities.

More recently there has been a number of new proposals and installations industrialising the landscape of the Karoo such as renewable energy facilities, as well as the construction of other facilities in the area such as the Square Kilometer Array.

The heritage of the Karoo is essentially a series of layers of events (or landscapes) that has become superimposed on the land surface. The earliest of these is the Karoo palaeontology – an ancient landscape that was deposited as a result of a vast inland sea. The shores and swamps of this landscape abounded with ancient species of fish, plants, invertebrates and early mammal-like reptiles. After the breakup of Gondwanaland the Karoo took on the geology that has resulted in its particular character. Millions of years later it was home to successions of early human occupation. Stone Age occupations of the Early, Middle and Later Stone age left half a million years of human made debris on the land surface. Superimposed on the Karoo landscape once more is the history of European colonisation and the wars that went with it.

Archaeological sites are expected at the Proposed Development Site. These will take the form of open scatters of stone artefacts, many situated on low ridges, or close to sources of water. The predominant need of prehistoric people was the need to be close to water and natural resources, and to seek shelter from the almost incessant wind that characterises the area. Any area that provided some form of shelter was favoured – large bushes, boulder clusters and mazes, while dolerite ridges could provide elevated camps that were a few degrees warmer in winter compared with the frost ridden flat plains. Late Stone Age San also made numerous rock engravings and where rock surfaces allowed, paintings.

Colonial period ruins and settlements are fairly numerous, as are farm buildings that date to the 19th century or earlier. The Karoo was also a theatre of conflict during the Anglo-Boer war. Although few major battles took place in the eastern Karoo, skirmishes were numerous with the town of Murraysburg being affected by action. It is not uncommon to encounter isolated graves on the landscape dating to precolonial times, or the war or 1919 Great Flu Epidemic which significantly ravaged the population.

10.4 Potential Impacts and Mitigation

10.4.1 Construction Impacts

During the construction phase of the Proposed Development the following activities are proposed that would have physical impacts on the landscape, and any heritage resources that lie on it, or beneath it:

- Construction of access roads to turbine locations, with a possibility of cut and fill depending on local topography:
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine location;
- Excavation of turbine foundations;
- Excavation of linear trenches for cables, typically laid adjacent to access tracks;
- Erection of the grid connection power lines; and
- Construction of electrical infrastructure including sub-stations.

Heritage, archaeological and paleontological sites, which are highly context sensitive, are most vulnerable to direct impacts (damage or destruction) resulting from the alteration of the land surface.

Impacts to palaeontology will result from road cuttings, or any form of excavation into the shale such as turbine foundation construction. The impact is the damage and loss of fossil material before scientists have the opportunity to examine the remains and as such there is potential for rare specimens to be destroyed.

A field survey and monitoring program (watching brief) during construction can result in a positive impact as new knowledge can be developed and injected into the scientific/ educational community.

10.4.2 Operational Impacts

During the operational life of the Proposed Development, it is expected that physical or direct impacts to heritage resources will diminish or cease, however indirect impacts are expected to occur for the duration of the operational phase. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape, i.e., its setting. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of the Proposed Development, impacts to remote and rural landscape and wilderness qualities are of concern and will be assessed in the EIA as mentioned in the Visual Impact Assessment (Chapter 4).

There will also be a visual impact from the associated infrastructure including overhead power lines and road cuttings into the sides of slopes, if required, which will have the potential to affect the cultural, natural and wilderness qualities of the area.

10.4.3 Decommissioning Impacts

The decommissioning phase may result in impacts similar to construction however as the activities will be focussed on the existing infrastructure, disturbance of buried objects at this stage is less likely.

At the decommissioning phase, with the removal of all above-ground infrastructure, any indirect impacts that occurred during the operational phase will be removed.

10.4.4 Mitigation

10.4.4.1 Construction Phase

The most appropriate way to manage direct impacts during the construction phase is to avoid the known features where possible through embedded mitigation via the design process. A survey will be undertaken at the EIA phase (Section 10.2.2) to inform the design process. Furthermore, once a draft layout is determined by the EIA process, this will be subject to micrositing of the turbine positions giving consideration to all other environmental, physical and technical constraints, and routing access roads around sensitive areas during the final design confirmation. If primary avoidance of the heritage resource is not possible, then some degree of mitigation can be achieved by systematically removing and documenting the archaeological material from the landscape. The NHRA requires that recorded archaeological material be stored indefinitely, which has cost implications and places a burden on the limited museum storage space available in the province.

10.4.4.2 Operational Phase

The number, size and placement of turbines will affect the indirect impacts on cultural setting through visual impacts. The final design will be determined through a process including consideration of:

- Positioning of turbines in such a way that they are as far as is feasible out of view of buildings or collections of buildings with heritage value;
- Positioning of turbines out of view of places of high cultural/heritage aesthetic significance;
- Undertaking road construction to minimise cut and fill operations; and
- Guarantees for the removal of turbines after their useful life.

10.5 Relevant Stakeholders/ Consultees

Within the EIA project team the following consultation will be carried out:

- With the visual impact assessment team to ensure that significant heritage sites are assessed as visual receptors on the landscape; and
- With the social impact specialist to better understand the concerns and interests of the affected community.

Consultation with heritage authorities is mandatory, furthermore the NHRA requires that heritage organisations that are registered with the heritage authority be consulted.

Since the study area covers two provinces, two provincial authorities will be involved. These are Heritage Western Cape in Cape Town and Ngwao-Boswa Jwa Kapa Bokone (Northern Cape Heritage Authority). Ngwao-Boswa Jwa Kapa Bokone is assisted by SAHRA on an agency basis from time to time as it is a small organisation with limited capacity. Heritage Western Cape is well staffed and fully independent of SAHRA.

The presence wind energy facilities in the Great Karoo is of concern to Heritage Western Cape who are questioning the desirability of such facilities in landscapes worth grading on account of aesthetic significance[142]. The EIA team will continue to liaise with Heritage Western Cape throughout this EIA process.

Murraysburg does not have a registered conservation body, however there is an interest group in Graaff-Reinet as well as a regional museum. The Western Cape branch of the

[142] Findings of April IACOM committee attended by author.

South African Archaeological Society is not constituted as a conservation body, however they have the potential to play an important role in these matters. These bodies will be contacted to establish the degree to which they wish to be involved in the EIA process.

It is necessary to discuss and agree with the consultees that field grading of the landscape or landscape forms within the Proposed Development Site as part of the field work.

It is also not uncommon for specific heritage focus groups to develop through the required public participation process. If such a group forms, the heritage specialist will be available to consult with them.

10.6 EIA Assessment Process

The EIA process will follow that set out in Section 1.2.5 of this Draft Scoping Report through the following key stages:

- Describing the baseline environment regarding cultural heritage, archaeology and palaeontology through desk based sources and survey methods as described above;
- Determining the sensitivity of the identified heritage receptors in the vicinity of the Proposed Development Site;
- Identifying and characterising the potential impacts in relation to the Proposed Development of a WEF and grid infrastructure considering the Magnitude, Extent, Duration and Reversibility of the impact;
- Feeding into the design of the Proposed Development so as to include embedded mitigation;
- Determining the significance of impacts in line with the resultant design;
- Assessment of the potential cumulative effects of the components of the Proposed Development both with each other, and other proposed grid infrastructure and WEF developments in the region;
- Where impacts exist which have unacceptable levels of impact, developing a strategy for mitigation, compensation, enhancement and monitoring measures associated with the Proposed Development. This will include management practices which will be input into the EMP; and
- Describing the residual effects, i.e., those remaining after mitigation.

11 NOISE

11.1 Introduction

Enviro-Acoustic Research CC was commissioned to undertake this section of the Draft Scoping Report to inform the EIA phase of the Proposed Development.

As described in Section 11.4, the potential impacts of the grid connection are limited to the construction phase and will be managed, as far as practicable through the EMP. For the WEF the assessment of noise impacts is more complex as this also relates to the operational phase and in particular the operation of the wind turbines.

11.2 Baseline Survey Methods

11.2.1 Legislation and Guidance

The following legislation and guidance is applicable or relevant, with further details provided in Appendix 11.1:

- Republic of South Africa Constitution Act;
- The Environment Conservation Act:
  - National Noise Control Regulations; and
  - Western Cape Provincial Noise Control Regulations;
- The National Environmental Management Act;
- The National Environmental Management: Air Quality Act;
- South African Noise Standards:
  - SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'[143];
  - SANS 10210:2004. 'Calculating and predicting road traffic noise'[144];
  - SANS 10328:2008. 'Methods for environmental noise impact assessments'[145]; and
  - SANS 10357:2004. 'The calculation of sound propagation by the Concave method'[146].
- International Guidelines:
  - Guidelines for Community Noise (World Health Organisation, 1999);
  - The Assessment and Rating of Noise from Wind Farms (ETSU, 1997);
  - Noise Guidelines for Wind Farms (Canada, 2008);
  - Equator Principals; and
  - IFC: General EHS Guidelines – Environmental Noise Management.

11.2.2 Requirements for Scoping

SANS 10328:2008 specifies the methodology to assess the noise impacts on the environment. The standard also stipulates the minimum requirements to be reported. These minimum requirements are:

- The purpose of the investigation;

[143] South African National Standards (SANS) 10103:2008 (Ed.6) The measurement and rating of environmental noise with respect to annoyance and to speech communication (Standard South Africa)
[144] South African National Standards (SANS) 10210:2004 (Ed.2.02) Calculating and predicting road traffic noise (Standard South Africa)
[145] South African National Standards (SANS) 10328:2008 (Ed.3) Methods for environmental noise impact assessments (Standard South Africa)
[146] South African National Standards (SANS) 10357:2004 (Ed.1.02) The calculation of sound propagation by the Concave method (Standard South Africa)

- A brief description of the Proposed Development;
- A brief description of the existing environment;
- The identification of noise sources from the Proposed Development, together with their respective estimated sound pressure levels or sound power levels (or both);
- The identified noise sources that were not taken into account and the reasons why they were not investigated;
- The identified noise-sensitive developments and the estimated impact on them;
- Any assumptions made with regard to the estimated values used;
- An explanation, either by a brief description or by reference, of the methods that were used to estimate the existing and predicted rating levels;
- The location of the measurement or calculation points, i.e., a description, sketch or map;
- Estimation of the environmental noise impact;
- Alternatives that were considered and the results of those that were investigated;
- A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation;
- A detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them;
- Conclusions that were reached;
- Recommendations, i.e., if there could be a significant impact, or if more information is needed, a recommendation that an environmental noise impact assessment be conducted; and,
- If remedial measures will provide an acceptable solution which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority.

In addition, the Draft Scoping Report should contain sufficient information to allow the EAP to compile the Plan of Study for the EIA (PSEIA), including the noise component.

In this regard the following is included to assist the EAP in the compilation of the PSEIA:

- The potential impacts will be identified in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected) as well as the extent of the impact;
- Evaluating the nature of the Proposed Development considering the location as well as the sound power emission levels of the wind turbines using the ISO 9613-2[147] sound propagation model;
- A statement regarding the potential significance of the identified impacts;
- The identification of issues to be investigated in more detail during the EIA phase; and
- Details regarding the methodology followed to estimate and assess the potentially significant impacts during the EIA phase.

[147] International Organization for Standardization (ISO) 9613-2:1996. Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (2012)

11.3 Baseline Environment

11.3.1 Environmental Sound Character

Background noise levels have been measured for other projects within 150 km of the Proposed Development which indicate the locality has a sound level character typical of a rural area during periods when wind speeds were below 3 m/s. These previously recorded measurements are considered applicable as the topography, vegetation and meteorological conditions for the Proposed Development are similar to the location of these sites and as such their results provide context for the scoping phase.

In rural areas the sounds from insects and birds tend to dominate the ambient sound character, with noises such as wind flowing through vegetation increasing as wind speed increases. Factors such as the season (e.g., dry or no leaves versus green leaves), the type of vegetation (e.g., grass, conifers, deciduous), the vegetation density as well as the total vegetation surface all determine both the sound level as well as spectral characteristics.

The following components are identified as having the capacity to change the noise character of the area, relative to other rural areas.

11.3.2 Topography

The Proposed Development Site occupies hilly terrain with altitudes varying between 1200 m and 1900 m above mean sea level, from west to east, with the geology dominated by mudstone, shale and sandstone with numerous dolerite intrusions. Topographic features can limit the propagation of noise.

11.3.3 Roads and Railways

The N1 national road passes through the far western part of the Proposed Development Site, in a southwest northeast orientation, where it intersects the R63 regional route. The R63 runs from Victoria West (to the northwest) to Graaff-Reinet (to the southeast) through Murraysburg and passes through the southern part of the Proposed Development Site. Three other minor local roads pass through the Proposed Development Site in a northerly direction towards Richmond; one through the Grid Connection Site (to the west of the WEF boundary), one through the centre of the WEF Site boundary and one which passes in and out of the eastern WEF Site boundary.

As observed from other projects in the area these roads carry little traffic and the long term noise impact from traffic is expected to be insignificant.

11.3.4 Land Use and Vegetation

The land use at the Proposed Development Site is more fully described in Chapters 5 and 9 of this Draft Scoping Report. It is predominantly agricultural land with sparse vegetation with surface erosion evident in areas. No other noise sources of significance are expected and current land use activities are not expected to significantly contribute to the background noise environment.

11.3.5 Noise Sensitive Receptors/ Developments

In this report the receptor is defined as any resident in the area, but excludes faunal species.

A desk based search was conducted using the DEA's Environmental Potential Atlas, with available topographical maps used to identify potential noise sensitive receptors/developments (NSD) up to 2 km from the WEF Site boundary. These NSDs are illustrated in Figure 11.1. It should be noted that these have not been confirmed as

occupied properties and as such are potential receptors. If they are occupied will be confirmed during the EIA phase.

11.4 Potential Impacts and Mitigation

11.4.1 Potential Construction Impacts

11.4.1.1 Construction equipment

Construction activities include:

- Construction of access roads;
- Establishment of turbine tower foundations;
- The possible establishment, operation and removal of concrete batching plants;
- The construction of any buildings;
- Digging of trenches to accommodate underground power cables;
- Construction of power line infrastructure;
- Construction of substations; and
- The erection of turbine towers and assembly of wind turbines.

The equipment likely to be required to complete the above tasks will typically include: excavator/graders, bulldozers, dump trucks, vibratory rollers, bucket loaders, rock breakers, drill rigs, flatbed trucks, pile drivers, TLB, concrete trucks, cranes, forklifts and various 4WD and service vehicles.

There are a number of factors that determine the audibility and potential of a noise impact on receptors. Maximum noise levels generated can be audible over a large distance, however, they are generally of very short duration. If maximum noise levels however exceed 65 dBA at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15 dB, the noise can increase annoyance levels and may ultimately result in noise complaints.

Potential maximum noise levels generated by various construction equipment as well as the potential extent of these sounds are presented in Table 1 of Appendix 11.2.

Typical sound power levels associated with various construction activities are presented in Table 2 of Appendix 11.2.

11.4.1.2 Material Supply

Instead of transporting concrete required for the turbine foundations to the Proposed Development Site using concrete trucks, portable concrete batching plants may be required to mix concrete onsite. Batching plant equipment may be relocated to different areas of the site as the works progress. The need for such batching plants, the number, and whether they will be moved is unknown at this stage.

Similarly, the need for and potential locations of borrow pits are unknown at this stage. A portable rock crusher plant and screen will most likely be required if the developer selects the use of a borrow pit as this will be used to generate rock material used for creation of onsite access tracks.

11.4.1.3 Blasting

Blasting may be required as part of the civil works to clear obstacles or to prepare foundations. Should a borrow pit be used to supply rocks for construction purposes, blasting could also be required.

However, blasting will not be considered during the EIA phase for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use minimum explosives and will occur in a controlled manner. With regards to blasting in borrow pits, explosives are used with a low detonation speed, reducing vibration, sound pressure levels and air blasts. The breaking of obstacles with explosives is also a specialized field, and when correct techniques are used, it causes less noise than using a rock-breaker;
- People are generally more concerned over ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast; and
- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties normally receive sufficient notice (siren), and the knowledge that the duration of the siren noise as well as the blast will be over relative fast, resulting in a higher acceptance of the noise.

As such blasting has been scoped out of further assessment in the EIA phase.

11.4.1.4 Traffic

Construction traffic to and from the site, as well as traffic on the site, has the potential to create significant noise impacts. The use of a borrow pits, onsite crushing and screening and on site concrete batching plants will significantly reduce heavy vehicle movement to and from the site.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period. Noise levels due to traffic will be estimated using the methodology stipulated in SANS 10210:2004 (Calculating and predicting road traffic noise).

11.4.2 Potential Operational Impacts

11.4.2.1 Wind Turbine Noise: Aerodynamic sources[148]

Aerodynamic noise is emitted by a wind turbine blade through a number of sources such as:

- Self-noise due to the interaction of the turbulent boundary layer with the blade trailing edge;
- Noise due to inflow turbulence (turbulence in the wind interacting with the blades);
- Discrete frequency noise due to trailing edge thickness;
- Discrete frequency noise due to laminar boundary layer instabilities (unstable flow close to the surface of the blade); and
- Noise generated by the rotor tips.

Therefore, as the wind speed increases, noises created by the wind turbine also increases. At a low wind speed the noise created by the wind turbine is generally low, and increases to a maximum at a certain wind speed when it either remains constant, increase very slightly or even drops as illustrated in Chart 11.1.

[148] *Renewable Energy Research Laboratory, 2006; ETSU R97: 1996*

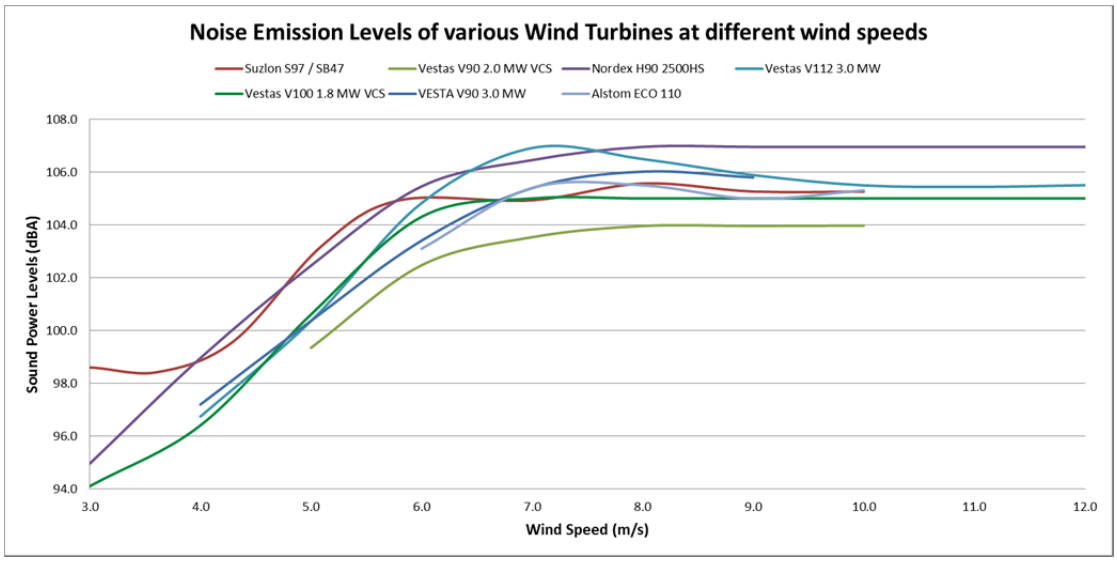


Chart 11.1: Noise Emissions Curve of a number of different wind turbines (figure for illustration purposes only)

11.4.2.2 Wind Turbine: Mechanical sources[149]

Mechanical noise is normally perceived within the emitted noise from wind turbines as an audible tone which is subjectively more intrusive than a broad band noise of the same sound pressure level. Sources for this noise may occur from:

- The gearbox (if the turbine design has one) and the tooth mesh frequencies of the step up stages;
- Generator noise caused by coil flexure of the generator windings which is associated with power regulation and control;
- Generator noise caused by cooling fans; and
- Control equipment noise caused by hydraulic compressors for pitch regulation and yaw control.

However, tones are normally associated with the older models of turbines and turbine manufacturers have started to ensure that sufficient forethought is given to the design of quieter gearboxes and the means by which these vibration transmission paths may be broken. New generation wind turbines typically do not emit any clearly distinguishable tones.

11.4.2.3 Transformer Noises (Sub-stations)

Also known as magnetostriction, transformer noise occurs when the sheet steel used in the core of the transformer tries to change shape when being magnetized. When the magnetism is taken away, the shape returns, only to try and deform in a different manner when the polarity is changed. This results in the 'hum' frequently associated with transformers.

This is a relative easy noise source to mitigate with the use of acoustic shielding and/or placement of the transformer and as such is not considered further in this Draft Scoping Report but will be considered in designing the facility and within the EMP.

[149] *Renewable Energy Research Laboratory, 2006; ETSU R97: 1996; Audiology Today, 2010; HGC Engineering, 2007*

11.4.2.4 Transmission Line Noise (Corona noise)

Corona noise is caused by the partial breakdown of the insulation properties of air surrounding the conducting wires. It can generate an audible and radio-frequency noise, but generally only occurs in humid conditions, as provided by fog or rain. A minimum line potential of 70 kV or higher is generally required to generate corona noise depending on the electrical design.

Corona noise has two major components: a low frequency tone associated with the frequency of the AC supply (100 Hz for 50 Hz source) and broadband noise.

The impacts of Corona noise are scoped out and as such will not be considered further. Corona discharges result in power losses, audible noises, electromagnetic interference, a purple glow, ozone production and insulation damage and as such Electrical Service Providers such as Eskom go to great lengths to design power transmission equipment to minimise the formation of corona discharges. In addition, it is an infrequent occurrence with a relatively short duration compared to other operational noises.

11.4.2.5 Low Frequency Noise[150]

Low frequency sound is the term used to describe sound energy in the region below ~200 Hz. The rumble of thunder and the throb of a diesel engine are both examples of sounds with most of their energy in this low frequency range. Infrasound is often used to describe sound energy in the region below 20 Hz. Almost all noise in the environment has components in this region although they are of such a low level that they are not significant (e.g., the wind, ocean, thunder).

While significant work has been done on this field, there exist uncertainties around Infrasound and Low Frequency Noise.

Because of the low rotational rates of the blades of a wind turbine, the peak acoustic energy radiated by large wind turbines is in the infrasonic range with a peak in the 8-12 Hz range. For smaller machines, this peak can extend into the low-frequency "audible" (20-20 kHz) range because of higher rotational speeds and multiple blades.

While problems have been associated with older wind turbines in the 1980s, this has been considered by the wind industry and modern turbines do not suffer from the same problems. As such this is not considered further within the scope of the EIA for the Proposed Development.

11.4.2.6 Amplitude modulation[151]

Although very rare, there is one other characteristic of wind turbine sound that increases the sleep disturbance potential above that of other long-term noise sources. The amplitude modulation of the sound emissions from the wind turbines creates a repetitive rise and fall in sound levels synchronized to the blade rotation speed, sometimes referred to as a “swish” or “thump”.

The mechanism of this noise is not known though various possible reasons have been put forward. Although the prevalence of complaints about amplitude modulation is relatively small, it is not clear whether this is because it does not occur often enough or whether it is because housing is not in the right place to observe it. Furthermore the fact that the

[150] *Renewable Energy Research Laboratory, 2006; DELTA, 2008; DEFRA, 2003; HGC Engineering, 2006; Whitford, Jacques, 2008; Noise-con, 2008; Minnesota DoH, 2009; Kamperman, 2008, Van den Berg, 2004*

[151] *Renewable Energy Research Laboratory, 2006; Audiology Today, 2010; HGC Engineering, 2007; Whitford, 2008; Noise-con, 2008; DEFRA, 2007; Bowdler, 2008*

mechanism is unknown means that it is not possible to predict when or whether it will occur.

Amplitude modulation is included in this report to highlight all potential risks, albeit extremely low risks such as this (low significance due to very low probability).

11.4.3 Potential Mitigation

During the construction phase best practice measures for construction activities will be incorporated into the EMP to minimise noise disturbance, in particular consideration will be given to the timing and location of noise generating activities and vehicle movements.

With regard to the operational WEF the design undertaken as part of the EIA will consider set-back distances from confirmed noise sensitive receptors. As a starting point a set-back distance of 2 km will be applied however this could be reduced dependent on local topographic issues and at this stage is provided as an indication of the design constraints.

11.4.4 Relevant Stakeholders/ Consultees

The development of a list of key stakeholders is an intrinsic part of the methodology for the noise assessment. The noise assessment will utilise information from the list of I&APs as well as conducting site visits to the local area in order to determine a full list of relevant consultees and stakeholders.

11.5 Assessment Methods

An overview of the proposed methodology is set out below and in Appendix 11.4.

11.5.1 Plan of Study

The following will be included in the EIA noise report to assist the EAP in the compilation of the PSEIA:

- Data provided by the developer will be used to model the potential noise impact on the identified NSD's. This will be done utilising background noise levels collected through site measurements recorded during the EIA phase;
- The potential impact will be evaluated (where possible) in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected) as well as the extent of the impact;
- Feedback to inform revisions to the layout of the WEF will be provided;
- The potential significance of the identified issues will be calculated based on the evaluation of the issues/impacts;
- The development of an EMP and a proposal of potential mitigation measures (if required); and
- Recommendations of any requirements for further study or monitoring will be made.

11.5.2 Noise Models

The noise emissions into the environment will be calculated during the EIA phase using the sound propagation models described by ISO 9613-2[152] (operational phase) and SANS 10357 (construction phase). The following will be taken into account:

- The octave band sound pressure emission levels of processes and equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;

[152] International Organization for Standardization ISO 9613-2 (Ed.1) Acoustics – Attenuation of Sound During Propagation Outdoors.

- The meteorological conditions in terms Pasquill stability;
- The preliminary layout details of the proposed project;
- The height of the noise source under investigation;
- Topographical layout; and
- Acoustical characteristics of the ground.

The noise emissions from the various traffic options will be calculated using the sound propagation model described in SANS 10210[153] during the EIA phase. Corrections such as the following will be considered:

- Distance of a noise-sensitive development from roads;
- Road construction material;
- Average speeds of travel;
- Types of vehicles used; and
- Ground acoustical conditions.

11.5.3 Noise Emissions from Identified Sources

Manufacturer warranted noise emission data will be used to calculate the potential noise emissions from the wind turbines. In the instance that this data is unavailable, sound emission data as measured and calculated in accordance with EIA 61400-11 (Wind turbine generator systems – Part 11: Acoustic noise measurements techniques) could be used instead.

The operating cycle and nature of the sound emission (impulsiveness, tonal character or potential low frequencies) would, where relevant, be considered when the expected rating level in the target area is calculated.

11.5.4 Determination of Rating Levels

The Concawe model defined in SANS 10357:2004 (construction phase) and the propagation model defined in ISO 9613-2 (operational phase) will be used to calculate projected equivalent noise levels.

Other input parameters used would include:

- Atmospheric pressure of 100 kPa;
- Air temperature of 20 ^{o}C;
- Relative humidity of 80%;
- Prevailing wind direction;
- Pasquill stability category D (Night/early evening, fast winds, little cloud cover);
- Appropriate ambient sound levels associated with a selected wind speed;
- Layout of the proposed facility;
- Study area in a grid of 100 by 100 m. An average height is selected if the topography xyz-file is not available in the correct co-ordinate system. This output is used the develop 3D-soundscape maps of the projects equivalent noise environment;
- Height of turbine above sea level as well as height of wind turbine above surface level;
- Projected outside equivalent noise levels at NSDs at height above sea-level (plus 1.5 m); and
- 50% soft ground surface.

[153] SANS 10210:2004. 'Calculating and predicting road traffic noise'

11.5.5 Impact Assessment Criteria

As introduced in Section 1.2.5 the assessment of the impact is a function of considering the sensitivity of the baseline, i.e., the receiving environment, against the potential impacts from the Proposed Development. The level of impact will be determined using the magnitude, duration and spatial extent of the impact, in combination with the consequence and probability level.

The criteria for the categories for these levels are explained in Tables 11.1 – 11.4 below.

Table 11.1: Impact Assessment Criteria – Magnitude

This defines the impact as experienced by any receptor.		
Rating	**Description**	**Score**
Low	Increase in average sound pressure levels between 0 and 3 dBA from the expected wind induced ambient sound level (proposed rating level). No change in ambient sound levels discernible. Total projected noise level is less than the Zone Sound Level in wind-still conditions.	2
Low Medium	Increase in average sound pressure levels between 3 and 5 dBA from the (expected) ambient sound level (proposed rating level). The change is barely discernable, but the noise source might become audible.	4
Medium	Increase in average sound pressure levels between 5 and 7 dBA from the (expected) ambient sound level (proposed rating level). Sporadic complaints expected. Any point where the zone sound levels are exceeded during wind still conditions.	6
High	Increase in average sound pressure levels between 7 and 10 dBA from the (expected) ambient sound level (proposed rating level). Medium to widespread complaints expected.	8
Very High	Increase in average sound pressure levels higher than 10 dBA from the (expected) ambient sound level (proposed rating level). Change of 10 dBA is perceived as 'twice as loud', leading to widespread complaints and even threats of community or group action. Any point where noise levels exceed 65 dBA at any receptor.	10

Table 11.2: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operational and closure phases). Will the receptors be subjected to increased noise levels for the lifetime duration of the project, or only infrequently.		
Rating	**Description**	**Score**
Temporary	Impacts are predicted to be of short duration (portion of construction period) and intermittent/occasional.	1
Short term	Impacts that are predicted to last only for the duration of the construction period.	2
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating.	4
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g., removal or destruction of ecological habitat) that	5

	endures substantially beyond the Project lifetime.	

Table 11.3: Impact Assessment Criteria – Spatial Extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.	3
National	The impact could have an effect that expands throughout the country (South Africa).	4
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	5

Table 11.4: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 25 %.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 25% and 50 %.	3
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined to be between 50% and 75%.	4
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be between 75% and 100 %.	5

11.5.6 Identifying the Potential Impacts Without Mitigation Measures

Following the assignment of the necessary scores to the respective aspects, the criteria are combined to result in a value for each impact (prior to the implementation of mitigation measures). Significance without mitigation is rated on the scale set out in Table 11.5.

Table 11.5: Criteria for identifying potential impacts without mitigation measures

Significance Rating (SR)	Category	Description
SR < 30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30 < **SR** < 60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance – could influence the decisions about the project if left unmanaged.
SR > 60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

The significance will be determined considering the defined magnitude of the noise level, the extent and duration of the noise impact, as well as the probability of the impact occurring.

The magnitude of the noise impact will be assessed by considering:

- The total projected cumulative noise level compared to the appropriate acceptable rating levels as defined in table 2 of SANS 10103:2008;
- The potential community response from table 5 of SANS 10103:2008. In addition, other relevant and suitable literature may be consulted as defined in the scoping report. In particular the likely ambient sound levels due to wind induced noises will be estimated at the wind speed under investigation and considered; and
- Projected noise levels considering the likely and projected ambient sound levels.

Likely ambient sound levels associated with wind speeds, as well as the projected change in ambient sound levels, would also be considered when estimating the probability that a NSD may be impacted by increased noise levels.

11.5.7 Identifying the Potential Impacts With Mitigation Measures (WM)

Should the significance of the impact without mitigation be medium or high, this will be recalculated on the basis of the reasonable mitigation measures that the developer would employ.

In order to gain a comprehensive understanding of the overall significance of the impact after implementation of the mitigation measures, it will be necessary to re-evaluate the impact. Significance with mitigation is rated on the scale in Table 11.6.

Table 11.6: Criteria for identifying potential impacts with mitigation measures

Significance Rating (SR)	Category	Description
SR < 30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30 < **SR** < 60	Medium (M)	Notwithstanding the successful implementation of the mitigation measures implemented to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

Significance Rating (SR)	Category	Description
SR > 60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

11.5.8 Cumulative Impacts

The cumulative noise impacts on the noise sensitive receptors from any other wind turbines within 5 km of the WEF design will be considered for assessment. This is likely to include the cumulative effects of the two phases of the WEF proposed as part of the Proposed Development, plus the cumulative effects with the neighbouring Ishwati Emoyeni WEF.

12 SOCIAL

12.1 Introduction

Tony Barbour Environmental Consulting was commissioned to undertake a specialist Social Impact Assessment (SIA) as part of an EIA process for the Proposed Development.

At this stage in the process there has been no consultation between the SIA Consultants and local communities and other affected parties that live in the area. However, the author has worked on other wind energy projects and the issues identified by the affected parties in these projects are, in many instances, likely to be similar to those raised for the Proposed Development. Detailed consultation will be undertaken during the assessment component of the SIA in the EIA phase incorporating the I&AP database and information from the PPP.

12.2 Baseline Survey Methods

The identification and assessment of social impacts will be guided by the Guidelines for specialist SIA input into EIAs adopted by DEADP in the Western Cape in 2007. The Guidelines are based on accepted international best practice guidelines, including the Guidelines and Principles for Social Impact Assessment (Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment, 1994[154]). The approach will include:

- Review of existing project information;
- Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks);
- Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers, etc.;
- Identification and assessment of the key social issues and opportunities;
- Preparation of Draft SIA Report, including identification of mitigation/optimisation and management measures to be implemented; and
- Finalisation of the SIA Report.

As indicated above, the detailed public consultation process will be undertaken during the EIA phase.

Typical social and economic baseline information required for the SIA is outlined below:

- Social and economic characteristics of the affected area;
- Demographic profile of the area (population numbers, race, age, gender, income, education and employment levels, etc.);
- Policy and planning framework for the site and surrounds (see below);
- Social and economic trends (historic and current) in the affected area;
- Social and economic drivers, both current and historical, in the affected areas, including key economic sectors;
- Social context of how people run their lives and the key factors that affect them on a day-to-day basis (livelihood strategies);
- An understanding of social networks, intra- and inter-household, community and extend support systems affected by the proposed development;
- Institutional arrangements, structures and capacity of the local authorities;
- An understanding of the institutional, local leadership and other power relationships that may be affected by the development;

[154] Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment (1994) Available online: http://www.nmfs.noaa.gov/sfa/social_impact_guide.htm (Accessed 24th June 2014).

- Level of services (housing, water, electricity, schools, clinics, policing, etc.) and current state of infrastructure in the area;
- Social and economic initiatives and opportunities;
- Local, regional and national social and economic policies, programmes, and plans affecting the area;
- Individuals, communities, organisations and institutions who are likely to be affected by the project/plan/policy, with specific emphasis on vulnerable individuals, communities, organisations and institutions;
- Land uses and ownership patterns in the area;
- Use and access to natural resources and livelihood strategies, especially in rural areas; and
- Cultural beliefs and value systems.

12.3 Baseline Environment

A detailed overview of the social baseline environment is reported in Appendix 12.1, a summary of which is included below.

12.3.1 Administrative Context

As can be seen in Figure 12.1, the majority of the Proposed Development Site is located within the BWLM, which is one of three local municipalities that make up the CKDM in the Western Cape Province. A small section of the site is also located in the Ubuntu Local Municipality within the Northern Cape Province.

The main settlements in the CKDM include Beaufort West, Nelspoort, Murraysburg, Prince Albert, Leeu Gamka, Prince Albert Road, Matjiesfontein and Klaarstroom. The closest town is Murraysburg, located on the R63 between Victoria West and Graaff-Reinet. It is described as an exceptionally poor town, with few businesses remaining. Unemployment is high and social problems due to poverty and destitution abound. There is no rail connection to Murraysburg and residents depend on road transport links to larger towns.

12.3.2 Economic Overview

The CKDM IDP (2012-2017) (Section 3.6.1 of this Draft Scoping Report) indicates that economic development remains a developmental challenge for CKDM, largely due to the low population density, distance from large markets and the arid climate. In addition there are high levels of unemployment and poverty and a lack of skilled workers.

12.3.3 Employment Overview

The Community survey of 2007 found that the CKDM had the lowest percentage of the Western Cape's labour force (0.8%) and also had the highest unemployment rate (30.8%). Based on the 2011 Census figures the unemployment rate in the CKDM was 23.1% compared to 21.6% for the Western Cape Province.

12.3.4 Transport Links

The N1 national road that bisects the Central Karoo is a key transport corridor for road-based freight transport, passenger services and private vehicles. It is a vital link bisecting South Africa on a northeast-southwest axis, providing access to and between Limpopo Province, Gauteng, the Free State and the Western Cape. This and the other transport links are identified on Figure 12.1.

12.4 Potential Impacts

12.4.1 Definition of Social Impacts

Social change is recognised as a natural and on-going process, however, it is important to recognise and understand that projects of this scale and nature have the potential to influence and alter both the rate and direction of specific social change both positive and negative. Social impacts can be defined as the consequences (both positive and negative) to human populations through any public or private actions (these include policies, programs, plans and or projects) that alter the way in which people function as members of society. These impacts are felt at various levels, including, individual, family or household, community and organisation or society level (Vanclay, 2002)[155].

12.4.2 Categories of Socio-Economic Impacts

- Way of life – how people live, work, play and relate to other people on a day-to-day basis;
- Culture – shared beliefs, customs, values, and language or dialect;
- Community health – its cohesion, stability, character, services and facilities;
- Political system – extent to which people are able to participate in decisions affecting their lives, the level of democracy and the resources available;
- Environmental health – quality of the natural environment in which people live, including the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety and their access and control over resources;
- Health and well-being – health is defined as a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity; and
- Personal and property rights – particularly in cases where people are economically affected, or experience personal disadvantage, which may include a violation of their civil liberties.

The key social issues that need to be assessed during the EIA phase include:

- The policy and planning related issues; and
- Local and site-specific issues.

12.4.3 Policy and Planning Issues

The legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with the 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.

The key documents reviewed are presented in Chapter 3 of this Draft Scoping Report.

The findings of the review indicated that renewable energy generation was strongly supported at national and provincial levels, both as a means to avoid negative environmental impacts associated with the use of finite fossil fuels and the generation of greenhouse gasses, as well a means to provide economic development (“green economy”) and employment creation. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges in the NDP (2011) (Section 3.4.5 of this Draft Scoping Report). Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

[155] Vanclay, F. 2002. Conceptualising Social Impacts. *Environmental Impact Assessment Review, 22*. 183-221.

12.4.4 Local and site specific issues

Based on a review of information relating to WEFs and experience with SIAs undertaken for other WEFs, the key social issues that are likely to be raised include:

- Potential impact on rural sense of place (this will be closely linked to the visual impacts). The impact on sense of place is not just from the WEF but also the associated grid connection infrastructure;
- Potential impact on farming activities and other existing land uses;
- Potential impact on property prices, specifically adjacent properties;
- Potential impact on tourism, both locally and regionally;
- Potential adverse impacts associated with the presence of construction workers during the construction phase. The typical adverse impacts associated with the presence of construction workers include increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community, etc.;
- Potential risk to security and safety of local farmers posed by construction workers;
- Potential adverse impacts associated with the influx of job seekers into the area during the construction phase. These impacts are similar to those associated with the presence of construction workers;
- Creation of employment and business opportunities during the construction phase;
- Creation of employment and business creation opportunities during the operational phase;
- Creation of potential training and skills development opportunities for local communities and businesses during the construction and operational phases;
- Potential beneficial up and down-stream economic opportunities for the local, regional and national economy;
- Provision of a clean, renewable energy source for the national grid; and
- Benefits associated with the establishment of a Community Trust.

12.5 Relevant Stakeholders/ Consultees

The development of a list of key stakeholders is an intrinsic part of the methodology for the SIA. The SIA will utilise information from the list of I&APs as well as conducting site visits to the local area in order to determine a full list of consultees and stakeholders.

12.6 Assessment Methods

The following typical, generic project information is required in order to inform the Social Impact Assessment.

12.6.1 Construction phase

- Comments received from I&APs during the PPP, including comments reflected in the Final Scoping Report;
- A plan of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
- Duration of the construction phase (months);
- Number of people employed during the construction phase;
- Breakdown of number of people employed in terms of skills categories (low skilled, semi-skilled and skilled);
- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for the construction phase;
- Indication of where construction workers will be housed (whether on site or in nearest town);

- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the components associated with the WEF will be transported to and assembled on site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required; and
- Information on the nature of the agreements with the affected landowners and or communities, specifically with regard to compensation for damage to land, infrastructure etc.

12.6.2 Operational phase

- Estimate of operating budget per annum;
- Estimate of total number of people employed;
- Breakdown in terms of skills levels (see above);
- Estimate of annual wage bill;
- Typical activities associated with the operational phase;
- Information on opportunities for skills development and training;
- Typical lifespan of Proposed Development;
- Information on the lease / rental agreements with local landowners and or communities, specifically with regard to issues relating to compensation for damage to infrastructure and loss of livestock etc. This information is required so as to indicate how local landowners and communities stand to benefit from the Proposed Development; and
- Information on establishment of community trust, etc.

12.6.3Assessment Methods

The Social Impact Assessment will follow the outline process as provided in section 1.2.5 of this Draft Scoping Report in that it will define the sensitivity of the receiving environment, utilising the above sources, and assess the potential impacts of the Proposed Development on this environment.

Consideration will be given to cumulative impacts by both considering the cumulative impacts of the components of the Proposed Development, and the cumulative impacts with other facilities in the region.

DRAFT SCOPING REPORT

COMBINED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 1 & 2 AND ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 & 2 WESTERN CAPE & NORTHERN CAPE

Chapter 13: Conclusions and Next Steps

13 CONCLUSIONS AND NEXT STEPS

This Draft Scoping Report has set out to introduce the Proposed Development, the project proponents, EAP and EIA Specialists. It provides a legal context, in terms of EIA requirements, and a planning and policy context for the Proposed Development as a Renewable Energy development, and has provided an overview of baseline environments, predicted impacts, key stakeholders and proposed EIA assessment methods which for the PSEIA for the following environmental areas:

- Visual;
- Terrestrial Ecology (Flora and Fauna);
- Bats;
- Wetlands and Freshwater;
- Avifauna;
- Soils and Agriculture;
- Cultural Heritage, Archaeology and Palaeontology;
- Noise; and
- Social.

EIA is ultimately a decision-making process with the specific aim of selecting an option that will provide an appropriate balance between benefits and (adverse) impacts. The EIA process should identify activities which may have a detrimental effect on the environment, and which would therefore require environmental authorisation prior to commencement.

The EIA process is usually carried out over the period of approximately 1 year from the date that the DEA were formally notified of the Proposed Development by the submission of application forms, which in this case was April 2014.

Environmental surveys have started and where possible this survey information has been included in this Draft Scoping Report which is being made available for public and stakeholder comment for a prescribed consultation period of 40 days. All comments received in response to the Draft Scoping Report will be incorporated into a Final Scoping Report and PSEIA. I&APs are then able to comment on the Final Scoping Report and PSEIA by submitting their comments directly to the DEA, notification regarding the availability of the Final Scoping Report and PSEIA as well as the contact details for submission to the DEA will be distributed to registered I&APs.

The Final Scoping Report is then submitted to the DEA, as the competent authority, for approval. This marks the formal end of the Scoping phase, after which the EAP undertakes the EIA and compiles the DEIAR which will then, like the Draft Scoping Report, be made available for public and stakeholder comment for a period of 40 days. Any comments will then be considered and incorporated as applicable into a FEIAR. I&APs are then notified of the availability of the FEIAR and advised that should they like to comment on the report, they must submit their comments directly to the DEA (contact details of the DEA will be included in the notification documents).

Once a FEIAR has been submitted the competent authority (the DEA) will make a decision on whether or not to grant or refuse Environmental Authorisation.