Appendix 6E
Soils and Agricultural Potential Assessment

SCOPING REPORT

On contract research for

SiVEST

SOIL INFORMATION FOR PROPOSED ALETTA WIND ENERGY FACILITY, NEAR COPPERTON, NORTHERN CAPE

By

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Report No. GW/A/2016/xx

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DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist and that I am independent of any of the parties involved and that I have compiled an impartial report, based solely on all the information available.

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January 2016

CONTENTS **Page**

1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by SiVEST to undertake a soil investigation near Copperton, in the Northern Cape Province. The objectives of the study are;

- To obtain all existing soil information and to produce a soil map of the specified area as well as

- To assess broad agricultural potential and the impacts thereon.

This report covers the proposed **Aletta Wind Energy Facility**.

2. SITE CHARACTERISTICS

2.1 Location

An area was investigated lying approximately 20 km to the east of the town of Copperton on the farm Drielingspan 101. The area lies between 29º 52′ and 30º 02′ S and between 22º 27′ and 22º 35′ E.

The study area is shown by the black line on Figure 1.

2.2 Terrain

The area lies at a height of approximately 1 100 to 1 150 metres above sea level, with very gentle (<2%) slopes), although several small rocky kopjes occur in places, especially in the north.

Only a few non-perennial drainageways are present in the vicinity but some small pans also occur.

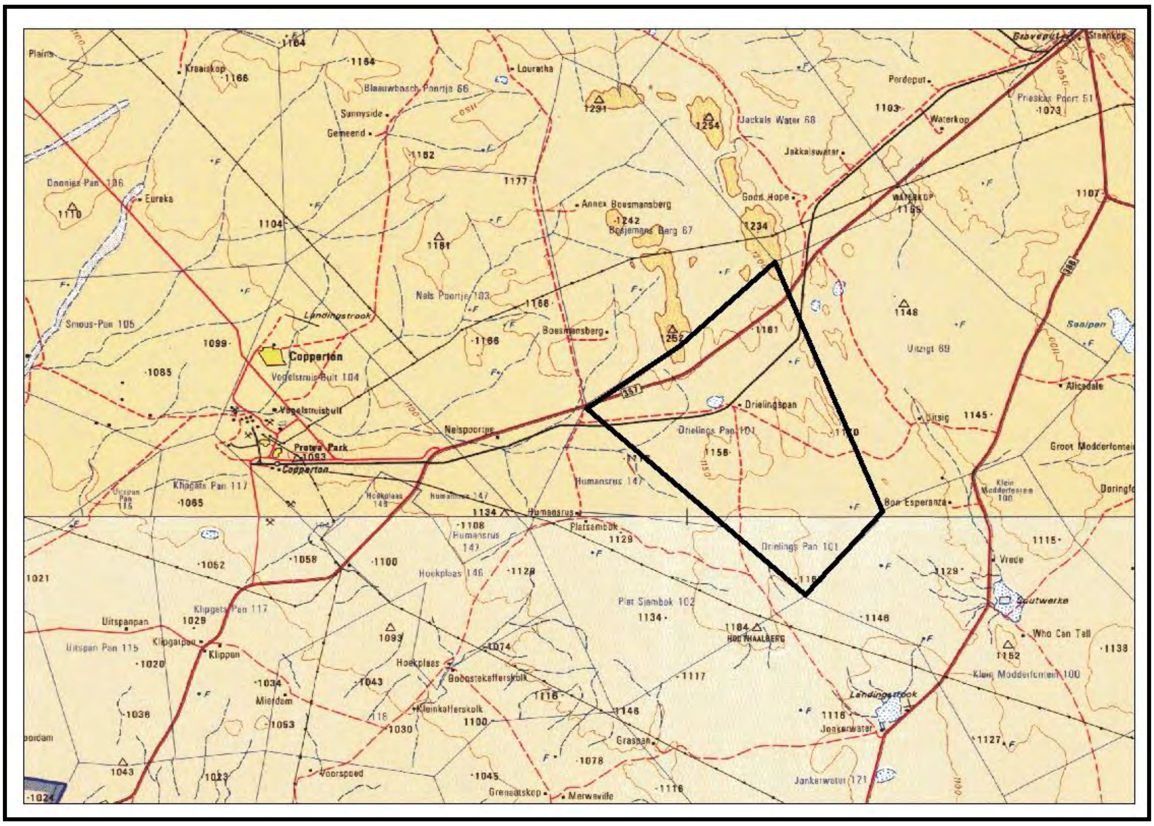

Figure 1 Locality map

2.3 Climate

The climate of the study area (Monnik & Malherbe, 2005) can be regarded as warm to hot with occasional rain in summer and dry winters. The long-term average annual rainfall in this region of the Northern Cape is only 198 mm, of which 138 mm, or 69%, falls from November to April. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is over 2 100 mm per year, peaking at over 8.5 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 31.6ºC and 11.8ºC for January to 15.9ºC and 1.0ºC for July respectively. The extreme high temperature that has been recorded is over 42ºC and the extreme low −10.0ºC. Frost occurs most years on 30-40 days on average between early May and mid-September.

2.4 Parent Material

The geology of the area comprises quartzite of the Uitdraai Formation, Olifantshoek sequence (Geological Survey, 1977).

The distribution of the geological units in the area is shown in Figure 2.

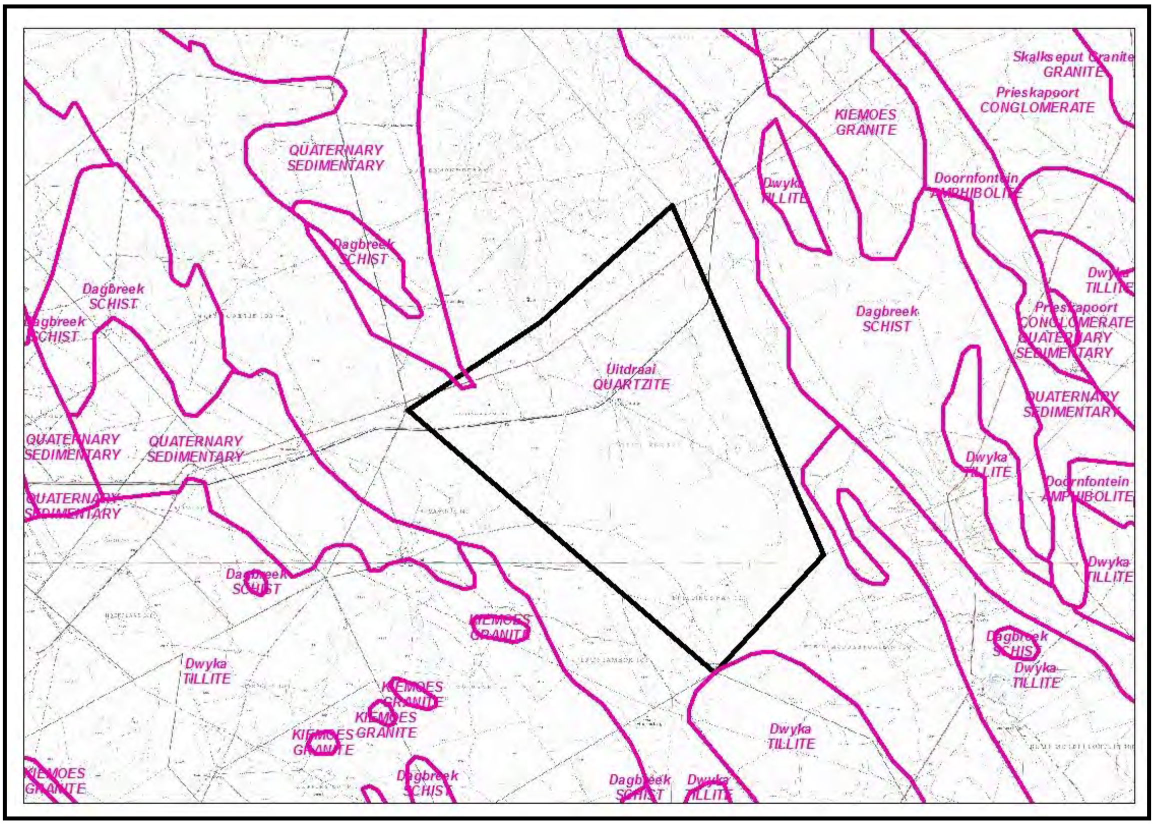

Figure 2 Geology

3. METHODOLOGY - SOILS

Existing soil information was obtained from the map sheets 2922 Prieska and 3022 Britstown (Bruce & Geers, 2005) from the national Land Type Survey, published at 1:250 000 scale. A ***land type*** is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al* (1977).

The area under investigation is covered by five land types, as shown on the map in the Appendix, namely:

- **Ag137, Ag138, Ag154, Ag158** (Shallow, red, freely-drained soils, high base status)
- **Ic50** (Very rocky areas with little or no soil)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.**

A summary of the dominant soil characteristics of each land type is given in Table 2 below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in **bold type**.

4. SOIL PATTERN

The soils are all shallow to very shallow (<500 mm), usually sandy and calcareous, overlying either rock or cemented hardpan calcrete. Some rock outcrops occur in places in the landscape.

The occurrence and distribution of the land types is shown in the Appendix.

A summary of the dominant soil characteristics is given in **Table 2** below.

Table 2 Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential* (%)
Ag137	20-300	Hutton 34/36/44/46	37%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0 Mod: 8.1 **Low: 91.9**
	10-100	Mispah 10/20/22	27%	Red-brown, sandy topsoils, on rock or hardpan calcrete	
	-	Rock	23%	Surface rock outcrops	
Ag138	50-300	Hutton 34/36	32%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0 Mod: 26.6 **Low: 73.4**
	500-800	Hutton 34/36/44/46	24%	Red, sandy/loamy soils on rock or hardpan calcrete	
	50-300	Hutton 44/46	22%	Red, sandy/loamy soils on rock or hardpan calcrete	
Ag154	50-300	Hutton 33/34/43	39%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0 Mod: 0.0 **Low: 100**
	350-650	Hutton 33/34/43	24%	Red, sandy/loamy soils on rock or hardpan calcrete	
	50-300	Mispah 10/Glenrosa 23	14%	Red-brown, sandy topsoils on rock or hardpan calcrete	
Ag158	-	Rock	45%	Surface rock outcrops	High: 0.0 Mod: 0.0 **Low: 100**
	50-300	Hutton 33/43	41%	Red, sandy/loamy soils on rock or hardpan calcrete	
	25-100	Mispah 10/20	14%	Red-brown, sandy topsoils, on rock or hardpan calcrete	
Ic50	-	Rock	45%	Surface rock outcrops	High: 0.0 Mod: 0.0 **Low: 100**
	25-250	Mispah 10	8%	Red-brown, sandy topsoils, on rock or hardpan calcrete	
	25-600	Hutton 34/36	8%	Red, sandy/loamy soils on rock or hardpan calcrete	

*Note: Agricultural Potential refers to **soil characteristics only**, without potentially restricting climatic factors

5. AGRICULTURAL POTENTIAL

Virtually all of the study area comprises shallow, often calcareous soils with rock outcrops, as can be seen from the information contained in Table 2 and the Appendix.

Coupled with these shallow soils, the very low rainfall in the area (Section 2.3) means that the only means of cultivation would be by irrigation and the Google Earth image of the area (Figure 3) shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation.

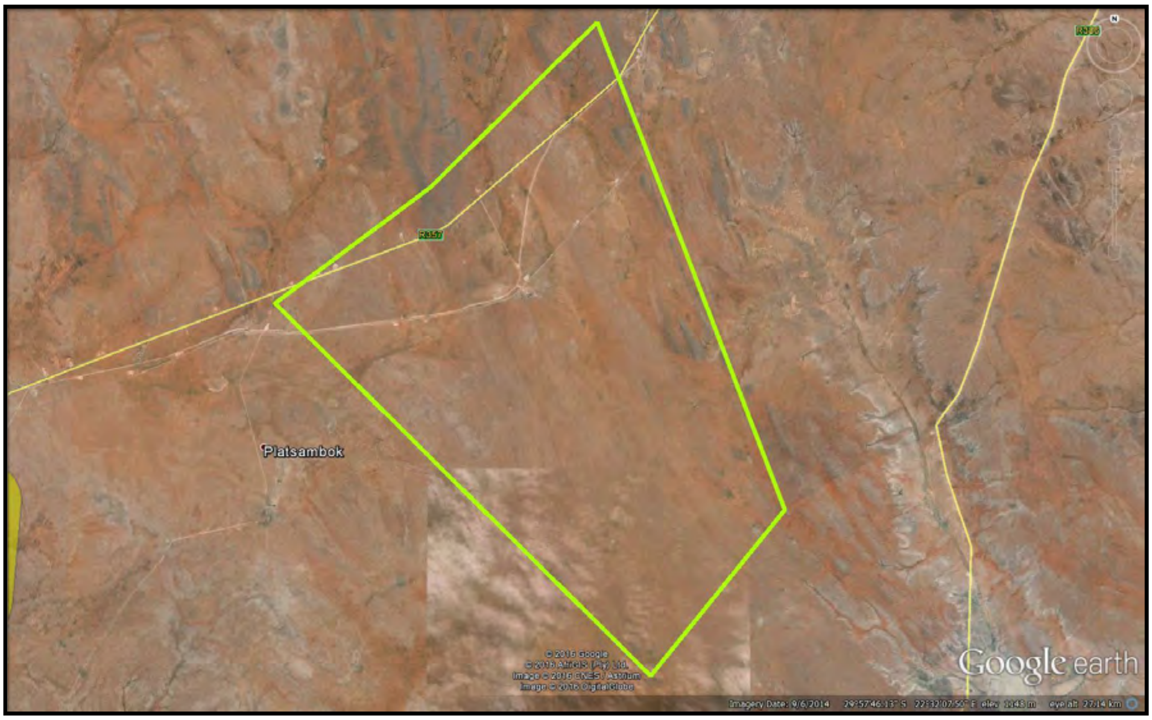

Figure 3 Google Earth image of study area

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit (ARC-ISCW, 2004).

5.1 Land Use

The land use in the area is dominantly "shrubland and low fynbos" with some small areas of "bare rock and soil (natural)" as classified by the National Land Cover (Thompson, 1999). As previously mentioned, there are no areas of cultivation that were identified, only a few small, isolated areas of "Improved grassland".

6. IMPACTS

Two main impacts are possible. The first deals with the unavailability of land for agriculture due to the fact that a wind energy generating facility is to be established, while the second impact refers to the possibility that construction of such a facility will lead to disturbance of the topsoil and surface vegetation cover, so that erosion of topsoil by wind action will increase.

Table 3 Rating of impacts

IMPACT TABLE FORMAT		
Environmental Parameter	*Soil resource*	
Impact	*Loss of agriculturally productive land*	
Extent (E)	*Site*	
Probability (P)	*Possible*	
Reversibility (R)	*Completely reversible*	
Irreplaceable loss of resources (I)	*Marginal*	
Duration (D)	*Medium term*	
Cumulative effect (C)	*Low*	
Intensity/magnitude (M)	*Medium, mainly due to low prevailing agricultural potential of area*	
Significance Rating	*(E+P+R+I+D+C) x M*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	**1**	**1**
Probability	**2**	**2**
Reversibility	**2**	**2**
Irreplaceable loss	**1**	**1**
Duration	**2**	**2**
Cumulative effect	**2**	**2**
Intensity/magnitude	**2**	**2**
Significance rating	**-20 (low negative)**	**-20 (low negative)**
Mitigation measures	*These would include: ensuring that the minimum area possible is set aside for the project infrastructure, so that the natural vegetation is undisturbed and grazing of livestock can continue on site post-construction.*	

IMPACT TABLE FORMAT		
Environmental Parameter	*Soil resource*	
Impact	*Increased potential for erosion of topsoil by wind*	
Extent (E)	*Local area*	
Probability (P)	*Probable*	
Reversibility (R)	*Partly reversible*	
Irreplaceable loss of resources (I)	*Marginal*	
Duration (D)	*Medium term*	
Cumulative effect (C)	*Medium, as wind-blown sediments can travel long distances*	
Intensity/magnitude (M)	*Potentially high, due to the dry climate and sandy nature of many of the topsoils in the area*	
Significance Rating	*(E+P+R+I+D+C) x M*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	**2**	**1**
Probability	**3**	**2**
Reversibility	**2**	**1**
Irreplaceable loss	**2**	**1**
Duration	**3**	**2**
Cumulative effect	**3**	**2**
Intensity/magnitude	**3**	**2**
Significance rating	**-45 (medium negative)**	**-18 (low negative)**
Mitigation measures	*Protection of the vegetation covering is vital, so that as little vegetation as possible to be removed. If bare topsoil results, it should be covered by a soil protection layer, such as a geotextile, to stabilize the site until vegetation can re-establish.*	

7. CONCLUSION

Due to the occurrence of shallow soils, coupled with the extremely hot and dry nature of the climate, it is not anticipated that a detailed soil survey will be required.

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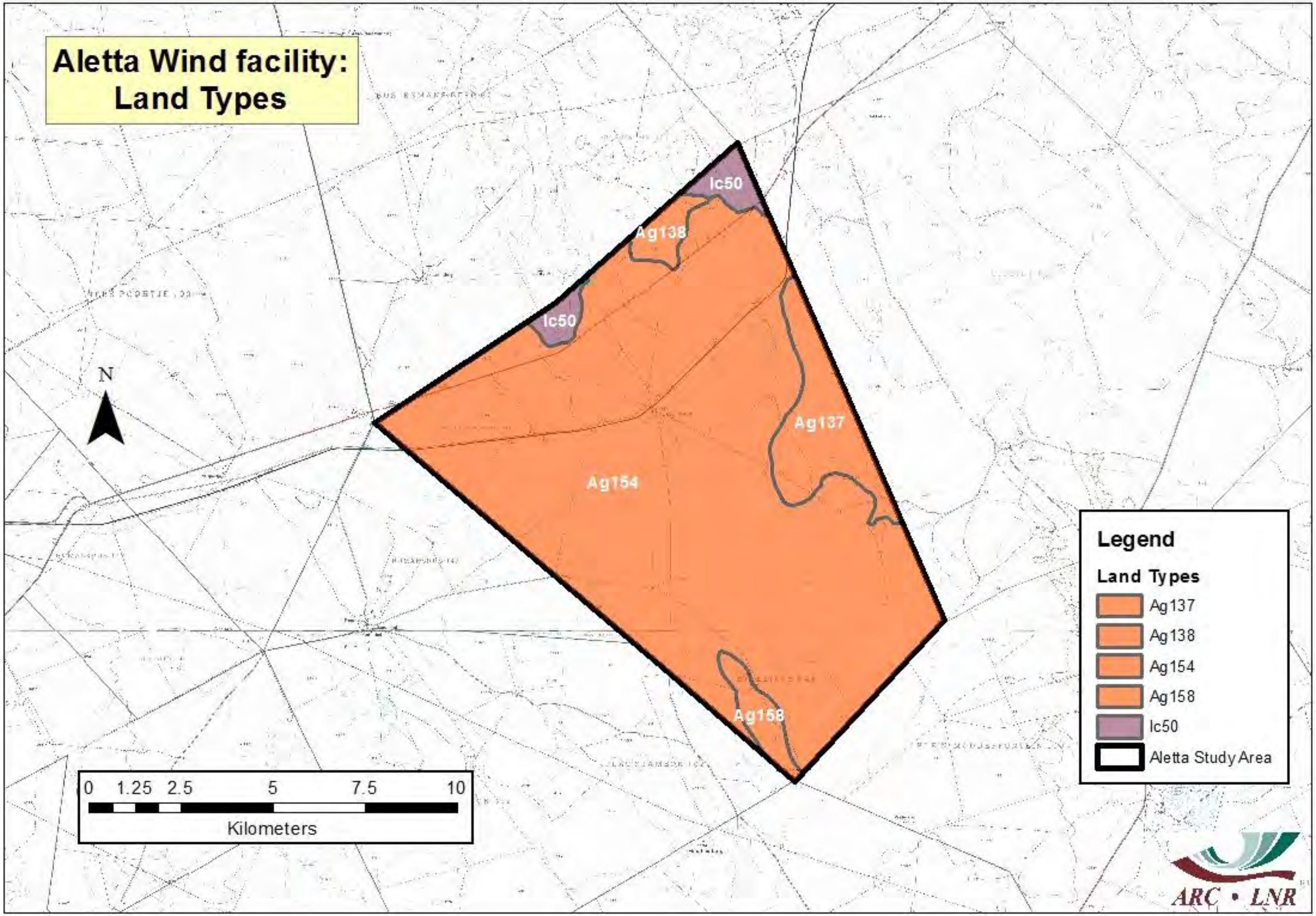
APPENDIX:

MAP OF LAND TYPES



Aletta Wind facility:
Land Types
N
Ic50
Ag138
Ic50
Ag137
Ag154
Ag158
Legend
Land Types
Ag137
Ag138
Ag154
Ag158
Ic50
Aletta Study Area
0 1.25 2.5 5 7.5 10
Kilometers
ARC • LNR

Appendix 6F
Noise Assessment

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ENVIRONMENTAL NOISE IMPACT STUDY FOR SCOPING PURPOSES INTO THE PROPOSED ESTABLISHMENT OF A WIND ENERGY FACILITY, ALETTA, NEAR COPPERTON IN THE NORTHEN CAPE PROVINCE

Prepared for

SiVEST (Pty) Ltd

by

A.W.D. Jongens

January 2016

EXECUTIVE SUMMARY

Biotherm Energy (Pty) Ltd is proposing to establish a Wind Energy Facility (WEF) called Aletta near Copperton in the Northern Cape Province. An initial Noise Impact Assessment (NIA) for scoping purposes was conducted into the potential impact of noise that might emanate from the construction, decommissioning and operation of the WEF for scoping purposes.

The results of the study indicated that the establishment of the proposed WEF would have significant acoustical implications on identified sensitive receptors and on surrounding land.

It is recommended that a more detailed noise impact study be conducted during the full EIA phase.

TABLE OF CONTENTS

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1 INTRODUCTION

Biotherm Energy (Pty) Ltd is proposing to establish a Wind Energy Facility (WEF) called Aletta near Copperton in the Northern Cape Province. Jongens Keet Associates (JKA) has been requested to conduct a Noise Impact Assessment (NIA) for scoping purposes into the potential impact of noise that might emanate from the operation of the WEF.

This report describes the required procedure to conduct an NIA for scoping purposes; limitations of existing assessment procedures; a description of the study area; and the estimated impact of noise from the proposed turbines on land surrounding the proposed WEF.

2 LEGISLATIVE FRAMEWORK AND REGULATORY GUIDELINES

In accordance with the Environment Conservation Act 73 of 1989, two procedures exist for assessing and controlling noise, respectively:

- The procedures contained in the South African National Standard (SANS) 10328:2008 *Methods for environmental noise impact assessments*.
- The procedures contained in the National Noise Control Regulations (NCR), Government Notice R 154, 10 January 1992 in terms of Section 25 the Environment Conservation Act 73 of 1989 are applicable to the Northern Cape Province.

Please refer to the Appendix for definitions of terms used. This highlights differences in definitions/terminologies contained in SANS 10328 and SANS 10103 and those contained in the NCR.

The following subsections reproduce parts of the SANS and NCR pertinent to this study.

2.1 SOUTH AFRICAN NATIONAL STANDARDS

Section 7 of SANS 10328 contains procedures to be followed to estimate the predicted impact that noise emanating from a proposed development would have on potentially affected land based on objective, scientific principles. The predicted impact is assessed in accordance with SANS 10103:2008 *The measurement and rating of environmental noise with respect to annoyance and to speech communication* by determining whether the estimated rating level of the predicted noise will exceed the actual residual (background) noise level on that land and/or the typical rating level of noise pertaining to the particular district as contained in Table 2 of SANS 10103.

If the rating level of the ambient noise under investigation exceeds the actual and/or the typical rating level, it is probable that the noise would be annoying or otherwise intrusive to a community exposed to the noise. This excess is then related to the probable response of a community to the noise as indicated in Table 5 of SANS 10103. Tables 2 and 5 of SANS 10103 are reproduced in part hereunder.

SANS 10103:2008, Table 2 — Typical rating levels for noise in districts

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req.T}$) for noise,** dBA					
	Outdoors			**Indoors, with open windows**		
	Day-night $L_{R,dn}$ [a]	**Day-time** $L_{Req,d}$ [b]	**Night-time** $L_{Req,n}$ [b]	**Day-night** $L_{R,dn}$ [a]	**Day-time** $L_{Req,d}$ [b]	**Night-time** $L_{Req,n}$ [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

SANS 10103:2008, Table 5 — Categories of community/group response

1	2	3
Excess **($\Delta L_{Req,T}$)** [a] dBA	**Estimated community/group response**	
	Category	**Description**
0 − 10	Little	Sporadic complaints
5 − 15	Medium	Widespread complaints
10 − 20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

In estimating the response of a community (such as residents) to a particular noise under investigation Table 5 of SANS 10103 incorporates the diversity of response of individuals of a particular community to the noise level. The estimated response to an excess of $L_{Req,T}$ of noise under investigation over the typical $L_{Req,T}$ is thus not in discrete 5 dB changes, but in overlapping ranges of excess.

2.2 NOISE CONTROL REGULATIONS

Regulation 3 – General Prohibition:

(c) "No person shall make changes to existing facilities or existing use of land or buildings or erect new buildings, if these will house or cause activities that will, after such changes or erection, cause a disturbing noise, unless precautionary measures to prevent the disturbing noise have been taken to the satisfaction of the local authority."

Regulation 4 – Prohibition of Disturbing noise:

"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, animal, machine, device or apparatus or any combination thereof."

Measuring point is defined in the appendix as just outside the boundary of the property from which noise emanates. It is pertinent to note that this is also the point of assessment of measured or predicted noise.

This encompasses the common law principle that the owner or occupier of land has the duty to exercise his or her rights of ownership or use in such a manner that they do not infringe on the rights of peace and enjoyment of property of adjoining owners whether it is occupied or not and accordingly may not influence the value of their property.

3 STUDY APPROACH

The noise impact study for scoping purposes was conducted primarily in accordance with Section 7 of the South African National Standard (SANS) 10328:2008, *Methods for environmental noise impact assessments* in terms of the National Environmental Management Act Nr 107 of 1998. A summary of the procedure is outlined hereunder.

a.) Identification and description of the noise sources associated with the proposed development.

b.) Identification of potential noise sensitive areas that could be impacted upon by noise emanating from the proposed development.

c.) Estimation of the acceptable rating level of noise on identified noise sensitive areas.

d.) Estimation of the noise emission from the identified noise sources and estimation of the expected rating level of noise at the identified noise sensitive areas.

e.) Estimation and assessment of the noise impact on identified noise sensitive areas in accordance with SANS 10103:2008 and The NCR.

f.) Consideration of possible alternative noise mitigation procedures.

g.) Determine whether the proposed development has significant acoustical implications.

h.) Recommend whether a full noise impact assessment be conducted.

4 LIMITATIONS AND ASSUMPTIONS

4.1 SANS AND NCR MEASUREMENT AND ASSESSMENT PROCEDURES

The Noise Impact Assessment in this study was conducted in accordance with the relevant South African National Standards (SANS) and Noise Control Regulations (NCR).

Over recent years it has internationally become increasingly evident that these procedures are inadequate in assessing the response of humans exposed to wind turbine noise. This is particularly evident for larger turbines with increased hub heights and rotor diameters. Efforts are underway in some countries to introduce more appropriate assessment criteria in their standards and regulations relating to turbine noise. However all are still based on sound levels averaged over extended time periods. As yet no efforts have commenced to revise standards or regulations in this country.

The single-figure, equivalent continuous A-weighted sound pressure level, L_{Aeq}, averaged over a daytime or night-time period has for decades been successfully applied to assess and control environmental noise. Typically this includes industrial noise and road traffic noise. The success is due to the level of noise ("loudness") from the respective sources being constant (industry) or varying slowly (road traffic) over an hour or longer periods of time. The noise is predictable from one day to another and therefore relatively simple to measure, predict and assess.

By contrast wind turbine noise is not constant. It can vary over short time periods from being inaudible to "very loud". It is described by exposed communities as varying between "swishing", low-frequency "whooshing" and at times loud, impulsive "thumping". This occurrence is termed Amplitude Modulation which is the rapid variation, within parts of a second, of the level ("loudness") of turbine noise. This is often accompanied by rapid changes in frequency content. Humans are particularly sensitive to both such changes that on occasions cause violent disruption of sleep with associated feelings of startle, anxiety, annoyance followed by psychological distress, headaches and other symptoms. Literature records that complaints have been received by affected communities residing 1,5 km from wind farms (G.P. van den Berg, 2004).

The increased noise levels can last for several minutes or rapidly reduce again to inaudibility. Sleep disturbance is often caused by a single, short noise event of a few seconds. Once awakened many affected stay awake waiting for the next occurrence even although after the event it may be very quiet. This heightens anxiety.

The variation and erratic nature of the noise render it distinctly more noticeable and intrusive than other man made noise. The disruptive human response is caused by rapid variations per second in instantaneous sound pressure level of up to 10 dB or more extending from infra-sound to mid audio frequencies lasting for several seconds or minutes. Yet the L_{Aeq} averaged over the obligatory 10 minute minimum measurement period might register no more than 30 dBA. This has been confirmed by numerous measurements conducted by this author.

The A-weighted L_{Aeq} that averages the level over extended time periods of minutes or hours is therefore an inadequate measure of humans' response to this phenomenon.

The single-figure L_{Aeq} value contains no information regarding the frequency content of noise. Much of the disturbance experienced by recipients of wind turbine noise is caused by low frequency content of the noise that is concealed by employing A-weighted sound levels. At separation distances beyond 100 m the low frequency content becomes increasingly dominant compared to high frequencies due to atmospheric absorption effects.

In addition the erroneous perception is held by many that when the wind blows turbine noise will be masked by noise from rustling trees and vegetation. The impact of turbine noise described in previous paragraphs occurs predominantly during the most noise sensitive period between sunset and sunrise when meteorological effects can cause significant wind speeds at the height of rotor blades (more than 100m above ground) whilst wind-still conditions prevail at ground level. Residual sound levels are very low resulting in insignificant masking noise thereby rendering turbine noise more noticeable during night-time.

4.2 NOISE SOURCES

At the time of compiling this report a preliminary layout of wind energy turbines was available. However no information of the size of the turbines being considered was available to enable preliminary calculations to be conducted to predict and assess the levels of noise.

The results of previous studies as well as wind energy turbine noise levels previously measured by this author were therefore used to provide guidance in this study.

Notwithstanding the predominant impact of Amplitude Modulated turbine noise, insufficient knowledge exists to predict its occurrence. It is thus not considered further in this report.

5 DESCRIPTION OF AFFECTED ENVIRONMENT

The proposed Aletta site is located approximately 28 km South West of Prieska and 14 km South East of the town Copperton that is reached via the R357. The R357 passes through the Northern part of the WEF.

Figure 1 displays an aerial view of the Aletta site and surrounding land. The area is rural with several noise sensitive receptors, namely, residential dwellings identified that could potentially be affected by noise emitted by the wind energy turbines.

The proposed WEF site is outlined in dark blue with a preliminary layout of 70 wind turbines. Identified noise sensitive residential areas are outlined by a light blue circle. Other than one of the residential areas located within the WEF boundaries, the approximate distances between residential areas and the nearest WEF boundary are included.

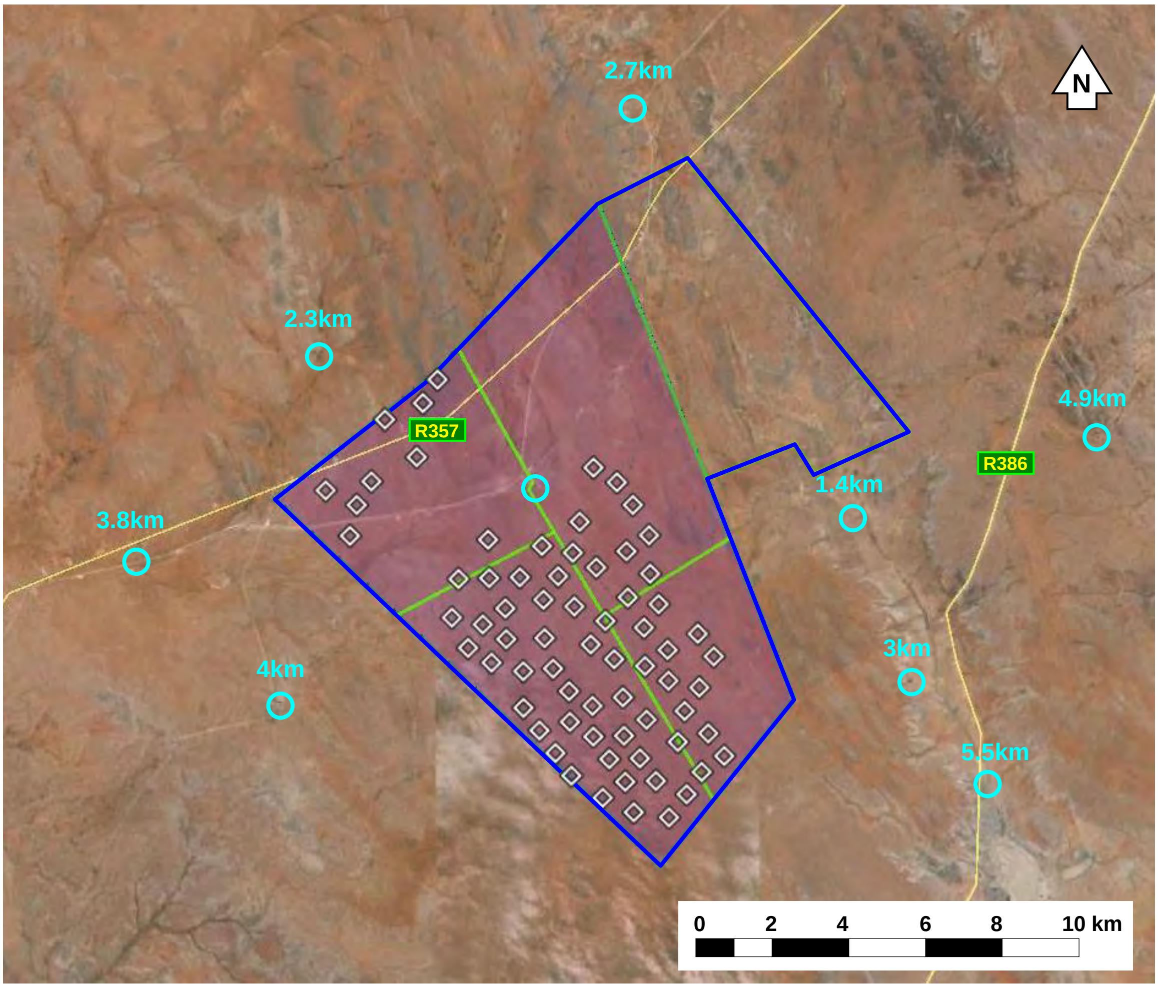

Figure 1 Proposed Aletta WEF with identified noise sensitive receptors

Residual (ambient) sound level measurements were not recorded during the scoping study phase. However, from previous experience it was anticipated that night-time levels would be between 20 and 30 dBA on land far removed from Copperton and the R357.

6 ESTIMATED NOISE IMPACT

6.1 CONSTRUCTION AND DECOMMISSIONING PHASES

The following construction and related activities that might result in a noise impact have been identified:

- Construction of access roads to each wind energy turbine location.

- Site works viz. preparation & clearance, excavation & construction of foundations.

- Establishment of lay down areas on site.

- Traffic including transport of components, material & equipment to site:

    - Civil construction equipment such as trucks, earth movers,
    - Aggregate, cement and other materials,
    - Wind turbine components,
    - Cranes & lifting equipment,

- Assemble towers and turbines.

- Establishment of ancillary infrastructure.

- Connection of wind turbines to the existing substation.

- Site remediation.

- Disassembling of towers and turbines, removal from site of same and rehabilitation of land upon decommissioning.

- Blasting

6.1.1 Traffic

The noise impact associated with traffic during the construction and decommissioning phases on the noise sensitive residential area within the WEF boundaries was considered highly probable if the existing the farm road leading to the residence were to be used.

The volume of such traffic is generally erratic and varies throughout the construction period. The impact of road traffic noise would need to be estimated during the EIA phase in accordance with SANS 10210:2004 *Calculating and predicting road traffic noise*.

6.1.2 Construction activities on site

The distance between the noise sensitive residential area within the WEF boundaries and the closest preliminary turbine locations would be such that a significant noise impact was anticipated not only during the construction phase but also from the turbines during operation phase.

All other noise sensitive areas would be located far removed from construction and related activities. No noise impact on the latter would be anticipated.

6.1.3 Blasting

Blasting is a highly regulated process encompassing numerous obligatory safety procedures for the protection of humans, animals, equipment and structures. Contrary to widespread belief, blasting can occur with minimal audible sound produced. Previously, this author was near a quarry conversing with personnel without being aware that blasting was taking place less than 100 m behind him other than a momentary and slight pressure variation felt by the ears. Noise from blasting was therefore excluded from further consideration.

6.1.4 Impact summary – construction phase

IMPACT TABLE 1	
Environmental Parameter	Noise
Issue/Impact/Environmental Effect/Nature	Temporary loss of “quiet” low residual noise level during **construction phase** for residential area within the WEF boundaries.
Extent	The impact will only affect residences on site.
Probability	Impact will likely occur.
Reversibility	Completely reversible. Construction noise ceases once infrastructure is in place.
Irreplaceable loss of resources	Marginal loss of “quiet” environment.
Duration	Short term. Construction noise ceases once infrastructure is in place.
Cumulative effect	Low cumulative impact. Construction noise ceases once infrastructure is in place.
Intensity/magnitude	Medium. Construction noise intrudes residential activities during daytime.
Significance Rating	Medium significance.

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-7 (low negative)

IMPACT TABLE 1	
Mitigation measures	• Construct access roads to avoid vehicle movements near residential area. • Restrict the construction activities to daytime.

Scoping Phase Impact Summary Table

ISSUE	**Impact: noise**
DISCUSSION	Temporary loss of quiet residual noise during construction process for noise sensitive area within the WEF boundaries.
EXISTING IMPACT	Negligible due to minimal road traffic
PREDICTED IMPACT	Medium if access to site would be via existing farm road in proximity of the noise sensitive residential area within the WEF boundaries
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Negligible once infrastructure is in place

6.2 OPERATION PHASE

It is apparent from Figure 1 that the preliminary locations of several turbines would be located on or close to the WEF property boundaries.

The NCR stipulate that the noise levels, measured just outside the property boundaries may not exceed the ambient (residual) level by 7 dB or more.

Of the wind energy turbines known by this author the A-weighted Sound Power emission levels of recently manufactured large turbines are typically of the order of 108 dBA. The results of previous Noise Impact Assessments of proposed Wind Energy Facilities have indicated that, for large turbines with large diameter rotors, a separation distance of at least 1 000 m from a perpendicular line of turbines would be required to comply with the NCR.

A similar separation distance would be required from noise sensitive receptors in order to comply with the NCR. Where a noise receptor is surrounded by turbines the separation distance would need to be increased for compliance with the NCR. However, the results of detailed spectrum analysis at noise sensitive receptors predicted high levels of low frequency noise at such separation distances with a high probability of such noise being considered intrusive. Refer to Section 4.1. This had been substantiated by the author during an investigation into complaints from a residential community of noise emanating from a wind farm.

In terms of Section 7.3.6 of SANS 10328 it was considered highly probable that the estimated expected rating level of the development would have a significant effect on the acceptable sound levels in the study area.

6.3 IMPACT SUMMARY – OPERATION PHASE

IMPACT TABLE 2		
Environmental Parameter	Noise	
Issue/Impact/Environmental Effect/Nature	Permanent loss of "quiet" low residual noise level during **operation phase** for residential areas within and beyond the WEF boundaries.	
Extent	The impact will affect residences on site and beyond the site boundaries.	
Probability	Impact will definitely occur.	
Reversibility	Partly reversible. Dependent on separation distances between turbines and boundaries.	
Irreplaceable loss of resources	Significant loss of "quiet" environment particularly during night-time.	
Duration	Long term. Noise impact will continue for operational life of the development.	
Cumulative effect	High cumulative impact. Operational noise will significantly impair the well-being of residents.	
Intensity/magnitude	Very high. Operational noise will significantly impair the well-being of residents.	
Significance Rating	High significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	3	1
Duration	3	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-72(high negative)	-8 (low negative)
Mitigation measures	Relocation of turbines to ensure separation distances to residences and boundaries result in acceptable noise levels at residences and compliance with the Noise Control Regulations beyond the site boundaries. This will require detailed calculations during EIA phase based on noise emission data of the turbines to be provided by the client.	

Scoping Phase Impact Summary Table

ISSUE	Impact: noise
DISCUSSION	Loss of quiet residual noise at noise sensitive areas.
EXISTING IMPACT	Negligible due to minimal man made noise
PREDICTED IMPACT	High
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High due to loss of existing low residual noise levels at noise sensitive area within the WEF boundaries.

7 NOISE MITIGATION

The only practical means of mitigating the noise impact at noise sensitive receptors would be to increase the separation distance between wind energy turbines and the receptors. The minimum separation distances would need to be determined by sound propagation calculations in accordance with SANS 10357:2004 *The calculation of sound propagation by the Concawe method* based on detailed sound power emission spectrum levels of the specific wind energy turbines being considered by the client and 3-dimensional topographical data of the study area.

8 CONCLUSIONS

The results of this scoping study indicated that the establishment of the proposed WEF could have acoustical implications on noise sensitive receptors in terms of SANS 10238.

9 RECOMMENDATIONS

In accordance with SANS 10328 it is recommended that a detailed noise impact study be conducted as outlined in Section 10.

10 DETAILED NOISE IMPACT ASSESSMENT DURING THE EIA PHASE

10.1 METHODOLOGY

A detailed noise impact study is to be conducted in accordance with Section 8 of SANS 10328. A summary of the procedure is outlined hereunder.

1. Determine the land use zoning on surrounding land and identify noise sensitive receptors that could be impacted upon by activities relating to the construction, operation and decommissioning of the wind farm.
2. Determine the existing ambient levels of noise within the study area.

3. Determine the typical rating level for noise on surrounding land at identified noise sensitive receptors.
4. Identify all noise sources, relating to the establishment and operation of the proposed wind farm that could potentially result in a noise impact on surrounding land and at the identified noise sensitive receptors.
5. Determine the sound power emission levels and nature of the sound emission from the identified noise sources.
6. Calculate the expected rating level of noise on surrounding land and at the identified noise sensitive receptors from the combined sound power levels emanating from identified noise sources in accordance with procedures contained in SANS 10357.
7. Calculate and assess the noise impact on surrounding land and at the identified noise sensitive receptors in terms of SANS 10103 and the Noise Control Regulations.
8. Investigate alternative noise mitigation procedures, if required, in collaboration with the design engineers of the facility and estimate the impact of noise upon implementation of such procedures.
9. Prepare and submit an environmental noise impact report containing the procedures and findings of the investigation.
10. Prepare and submit recommended noise mitigation procedures as part of a separate environmental noise management plan, if relevant.

10.2 INFORMATION REQUIRED

The following information is required in order to conduct detailed noise impact study:

- Digital Terrain Model with 3-dimensional topographical data of the wind farm and land extending 5 000 m beyond the wind farm boundaries and 3-dimensional location of all turbines. File format: X, Y, Height in Excel or text files; all GEO-referenced to WGS_1984 World co-ordinates (not South African) and Transverse Mercator projection.
- Manufacturer, hub height, rotor diameter and noise emission data of the wind turbines in the form of 1/3rd octave frequency band sound power levels extending from 20Hz through 8000Hz for various wind operating speeds and tonality audibility values at respective frequencies as measured in accordance with Section 7 of IEC 61400-11 Wind turbines – acoustic noise measurement techniques. A copy of the full IEC 61400-11 test report would be preferable.

REFERENCES

Van den Berg, G.P.,2004. Effects of the wind profile at night on wind turbine sound. Journal Sound & Vibration 277, 959-970.

SANS 10328:2008, Methods for environmental noise impact assessments.

SANS 10103:2008, The measurement and rating of environmental noise with respect to annoyance and to speech communication.

National Noise Control Regulations, Government Notice R 154, 10 January 1992.

SANS 10357:2004, The calculation of sound propagation by the Concawe method.

APPENDIX

This appendix contains terms defined in SANS 10103 and the NCR used in the measurement and assessment and/or control of sound, or noise. Their meanings are in certain instances loosely described to facilitate understanding.

Ambient noise
the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far. It includes the noise from the noise source(s) under investigation.

A-weighted sound pressure level, L_{pA}
The sound pressure level, in decibels, relative to a reference sound pressure, p_0, and incorporating an electrical filter network (A-weighted) in the measuring instrument corresponding to the human ear's different sensitivity to sound at different frequencies. It is given by the following equation:

$$L_{pA} = 10 \text{ Log}\left(\frac{p_A}{p_0}\right)^2 \text{ dBA} \qquad p_0 = \text{reference sound pressure} = 20 \text{ micro Pascal}$$

A-weighted sound power level, L_{WA}
The A-weighted (as above) sound power level, in decibels, emitted by a sound source relative to a reference sound power of 10^{-12}W

Equivalent continuous A-weighted sound level, $L_{Aeq,T}$
A formal definition is contained in SANS 10103. The term "equivalent continuous" may be understood to mean the "average" A-weighted sound level measured continuously, or calculated, over a period of time, T.

Equivalent continuous rating level, $L_{Req,T}$ (often referred to as sound level or noise level)

The equivalent continuous A-weighted sound level, $L_{Aeq,T}$, measured or calculated during a specified time interval T, to which is added adjustments for tonal character, impulsiveness of the sound and the time of day. An adjustment of 5 dB is added for any tonal character, if present. If the noise is of an impulsive nature an adjustment of 5 dB is added for regular impulsive noise and 12 dB for highly impulsive noise. Where neither is present, the $L_{Req,T}$ is equal to the $L_{Aeq,T}$.

Reference time interval
The time interval to which an equivalent continuous A-weighted sound level, $L_{Aeq,T}$, or rating level of noise, $L_{Req,T}$, is referred. Unless otherwise indicated, the reference time interval is interpreted as follows:

- Day-time: 06:00 to 22:00hrs T=16 hours when $L_{Req,T}$ is denoted $L_{Req,d}$
- Night-time: 22:00 to 06:00hrs T=8 hours when $L_{Req,T}$ is denoted $L_{Req,n}$

In the case of a typical working day of 8 hours T=8 hours

Equivalent continuous day/night rating level, $L_{R,dn}$

The equivalent continuous A-weighted sound level, $L_{Aeq,T}$, for T = 24 hrs with adjustments for tonality and impulsiveness, as above, plus adjustment of 10 dB added to $L_{Req,n}$

Residual noise (often referred to as background noise)

The ambient noise that remains at a given position in a given situation when one or more specific noises (usually those under investigation) are suppressed or absent.

District

This is related to, but not necessarily equal to, "land-use zoning" applied in urban and regional planning. For example, mixed-use zoning may comprise a central business district and a residential district.

Hz

Abbreviation of the unit hertz used to denote cycles per second of the frequency of sound.

Octave

A doubling or halving of a particular frequency

<u>Terms defined in the Noise Control Regulations:</u>

Ambient sound level means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Noise level means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5 dBA is added.

Disturbing noise means a noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

Note: this would fall within the "medium" category of estimated community/group response in Table 5 of SANS 10103.

Measuring point, relating to-

(a) a piece of land from which an alleged disturbing noise emanates, means a point outside the property projection plane where an alleged disturbing noise, in the opinion of a local authority, shall be measured in accordance with provisions of regulation 6;

Certain terminologies used in the Noise Control Regulations and in the SANS 10328 and 10103 have similar sounding, but not equal, meanings. Thus,

<u>Noise Control Regulations:</u>		<u>SANS 10328 & 10103:</u>
Ambient sound level	is equivalent to	Rating level of residual noise
Noise level	is equivalent to	Rating level of ambient noise

In order to avoid confusion **residual noise** as defined in SANS 10328 and SANS 10103 is used in this report.

Appendix 6G
Visual Assessment

BIOTHERM ENERGY PTY (LTD)

Proposed Construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province

Visual Impact Assessment Report – Scoping Phase

Issue Date: 24 February 2016
Revision No.: **1**
Project No.: 13169

Date:	24 February 2016
Document Title:	Proposed Construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province: Visual Impact Assessment Report – Scoping Phase
Author:	Stephan Jacobs BSc Environmental Sciences (UP) B.Sc. (Hons) Environmental Management and Analysis (UP)
Revision Number:	#0.1
Checked by:	Kerry Schwartz
Approved:	Kelly Tucker
Signature:	
For:	SiVEST Environmental Division

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province

Specialist:	**SiVEST Environmental**		
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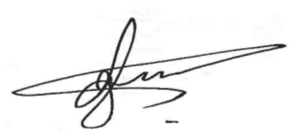
The specialist appointed in terms of the Regulations

I, **Stephan Jacobs**, declare that --

General declaration:

- I act as the independent specialist in this application;
- I will 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;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist

SiVEST Environmental

Name of company (if applicable)

24 February 2016

Date

BIOTHERM ENERGY PTY (LTD)

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT – SCOPING PHASE

Contents Page

List of Figures

List of Tables

Appendices

Appendix A: Impact Rating Methodology

GLOSSARY OF TERMS

ABBREVIATIONS

DSR	Draft Scoping Report
DTM	Digital Terrain Model
EIA	Environmental Impact Assessment
GIS	Geographic Information System
I&AP	Interested and/or Affected Party
NGI	National Geo-Spatial Information
OHL	Overhead Lines
SANBI	South African National Biodiversity Institute
VIA	Visual Impact Assessment

DEFINITIONS

Anthropogenic feature: An unnatural feature as a result of human activity.

Cultural landscape: A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

Scenic route: A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Sensitive visual receptors: An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.

Study area: The study area is assumed to encompass a zone of 8km from the outer boundary of the wind energy facility's development area. This is also referred to as the visual assessment zone.

Viewshed: The geographical area, based entirely on topography, from where an object / structure would be visible, i.e. the zone of visual influence. The viewshed defines the outer boundary of a visual envelope, usually along crests and ridgelines.

Visual character: The physical elements and forms and land use related characteristics that make up a landscape and elicit a specific visual quality or nature. Visual character can be defined based on the level of change or transformation from a completely natural setting.

Visual contrast: The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.

Visual envelope: A geographic area, usually defined by topography, within which a particular project or other feature would generally be visible.

Visual exposure: The relative visibility of a project or feature in the landscape.

Visual impact: The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Visual receptors: An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities and motorists travelling along routes that are not regarded as scenic.

Visual sensitivity: The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

BIOTHERM ENERGY PTY (LTD)

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT – SCOPING PHASE

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) are proposing to construct the Aletta Wind Energy Facility (hereafter referred to as the 'proposed development'), near Copperton within the Northern Cape Province. The proposed development will consist of a 140MW export capacity wind energy facility referred to as Aletta Wind. SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) have been appointed by BioTherm to undertake an Environmental Impact Assessment (EIA) for the proposed construction of the wind energy facility. As part of the EIA study, the need to undertake a visual impact assessment (VIA) has been identified. Accordingly a desktop scoping-level visual impact assessment study has been conducted to identify key visual issues relating to the development of the wind energy facility within this context and determine the potential extent of visual impact. This is done by characterising the visual environment of the area and identifying areas of potential visual sensitivity that may be subject to visual impacts.

1.1 Wind Energy Facility Technical Details

The key technical details and infrastructure required is presented in the table below (**Table 1**).

Table 1: Aletta Wind Energy Facility summary

Project Name	DEA Reference	Farm name and area	Technical details and infrastructure necessary for the proposed project
Alettta Wind Farm	To be announced	▪ Portion 1 of Drielings Pan No.101 ▪ Portion 2 of Drielings Pan No.101	▪ Between **80 and 125 wind turbines** with a total generation capacity of up to 140MW. Turbines will have a hub height of up to 120m and a rotor diameter of up to 150m.

		▪ Portion 3 of Drielings Pan No.101 ▪ Remainder of Drielings Pan No.101 Development Area: 10 000 ha	▪ The turbines will be connected via **medium voltage cables** to the proposed 132kV on-site Aletta Substation**.** ▪ Internal **access roads** are proposed to be between 4m to 6m wide. ▪ A temporary construction **lay down area.** ▪ The **operations and maintenance buildings**, including an on-site spares storage building, a workshop and an operations building. ▪ **Fencing** (if required) will be up to 5m where required and will be either mesh or palisade.

The key components of the project are detailed below.

1.1.1 Turbines

The total amount of developable area is 10 000 hectares. The wind turbines and all other project infrastructure will be located strategically within the development area based on environmental constraints. The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The wind turbines will therefore likely have a hub height of up to 120m and a rotor diameter of up to 150m (**Figure 1**). The blade rotation direction will be clock-wise. Each wind turbine will have a foundation diameter of up to 20m, and will be approximately 3m deep. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). The excavation area will be approximately 1 000m^2 in sandy soils due to access requirements and safe slope stability requirements. A hard standing area / platform of approximately 2 400m^2 (60m x 40m) per turbine will be required for turbine crane usage. There will be approximately 80 to 125 wind turbines constructed with a total generation capacity of up to 140MW. The electrical generation capacity for each turbine will range from 1.5 to 3.5MW depending on the final wind turbine selected for the proposed development.

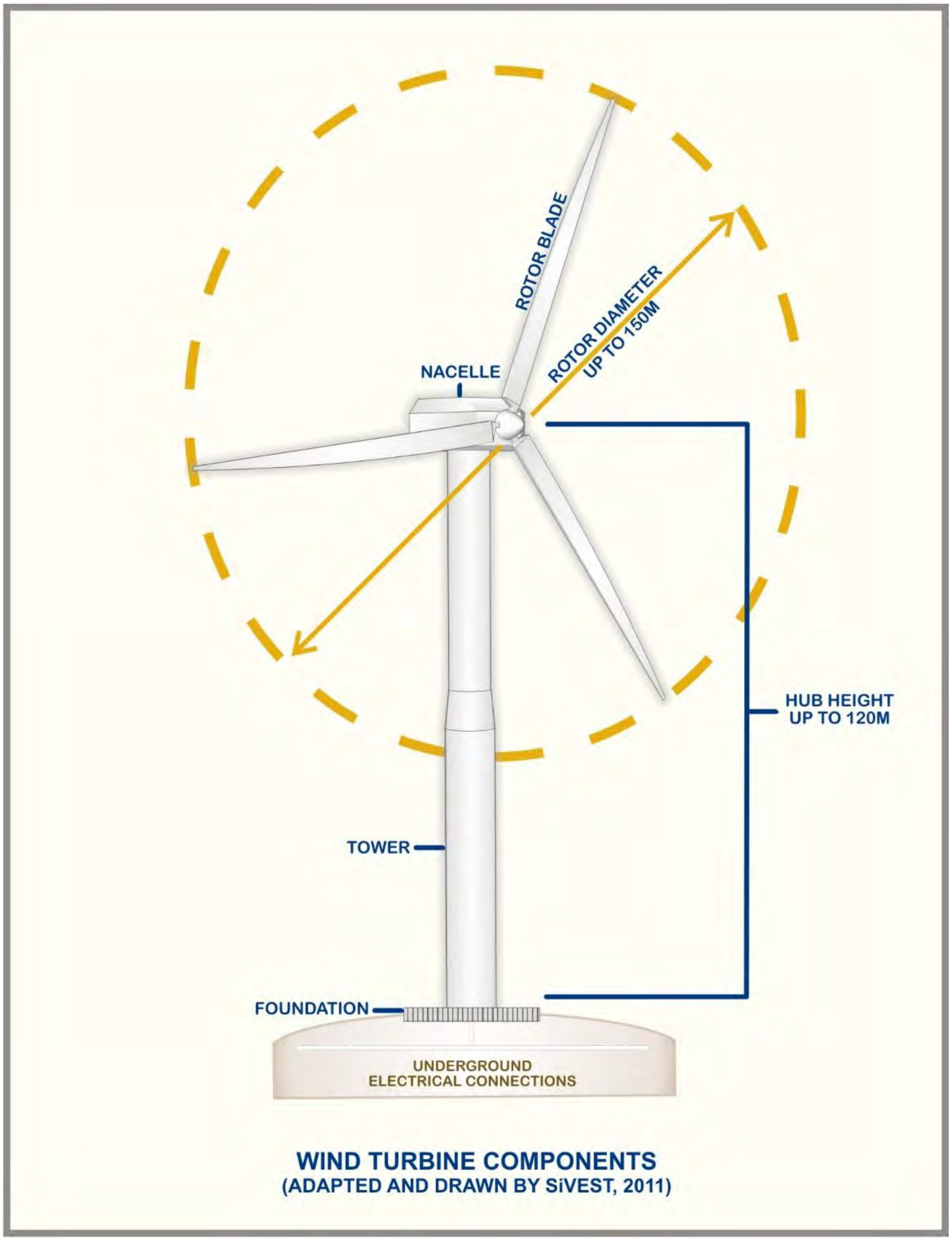


Figure 1: Typical Components of a Wind Turbine

1.1.2 Electrical Connections

The wind turbines will be connected (**Figure 2**) to the proposed on-site Aletta 132kV substation using buried (up to a 1.5m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are more appropriate such as over rivers, gullies and long runs. Where overhead power lines are to be constructed, self-supported or H-pole tower types will be used. The height will vary depending on the terrain, but will ensure minimum Overhead Line (OHL) clearances with buildings, roads and surrounding infrastructure will be maintained. The dimensions of the specific OHL structure types will depend on electricity safety requirements. The exact location of the towers, the selection of the final OHL structure types and the final designs will comply with the best practise and SANS requirements.

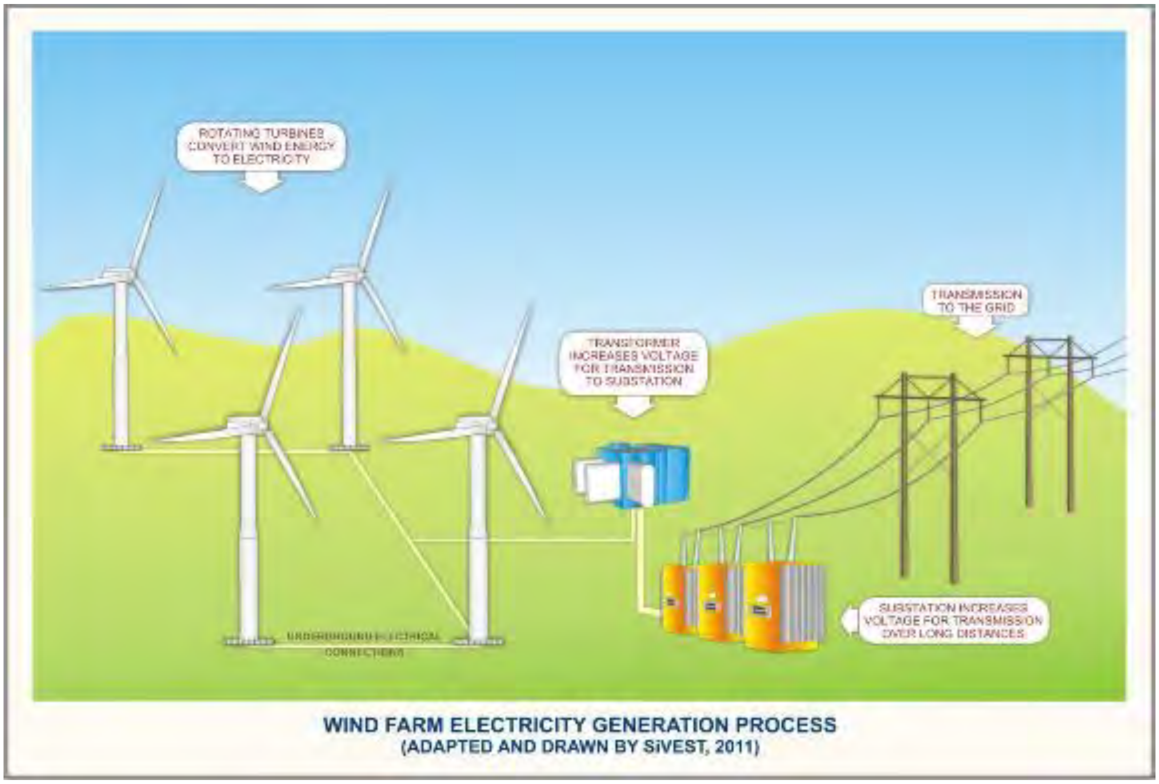


Figure 2: Conceptual Wind Energy Facility Electricity Generation Process showing Electrical Connections

1.1.3 Roads

Internal access roads are proposed to be between 4m and 6m wide with a total length of up to 60km each. This will include the net load carrying surface excluding any V drains that might be required. Double width roads will be required in strategic places for vehicle passing.

1.1.4 Temporary Construction Area

The temporary construction lay down area will be approximately 2 400m² (60m x 40m). The lay-down / staging area will be approximately 11 250m² whilst the lay-down area for concrete towers (only if required) will be approximately 40 000m².

1.1.5 Operation and Maintenance Buildings

The operation and maintenance buildings will include an on-site spares storage building, a workshop and operations building with a total combined footprint that will not exceed 300m². The operation and maintenance buildings will be situated in proximity to the wind farm substation due to requirements for power, water and access.

1.1.6 Other Associated Infrastructure

Other infrastructure includes the following:

- Fencing (if required) will be up to 5m where required and will be either mesh or palisade.

1.2 Site Location

The proposed development will be located approximately 20km east of Copperton, within the Pixley ka Seme District Municipality of the Northern Cape Province. More specifically, the proposed development is situated within the Siyathemba Local Municipality (**Figure 3**). The study area is located on the following properties:

- Portion 1 of the Farm Drielings Pan No. 101;
- Portion 2 of the Farm Drielings Pan No. 101;
- Portion 3 of the Farm Drielings Pan No. 101; and
- Remainder of the Farm Drielings Pan No. 101.

The project site has been identified through pre-feasibility studies conducted by BioTherm based on grid connection suitability, competition, flat topography, land availability and site access.

The proposed development location is shown in the locality map (**Figure 4**) below.

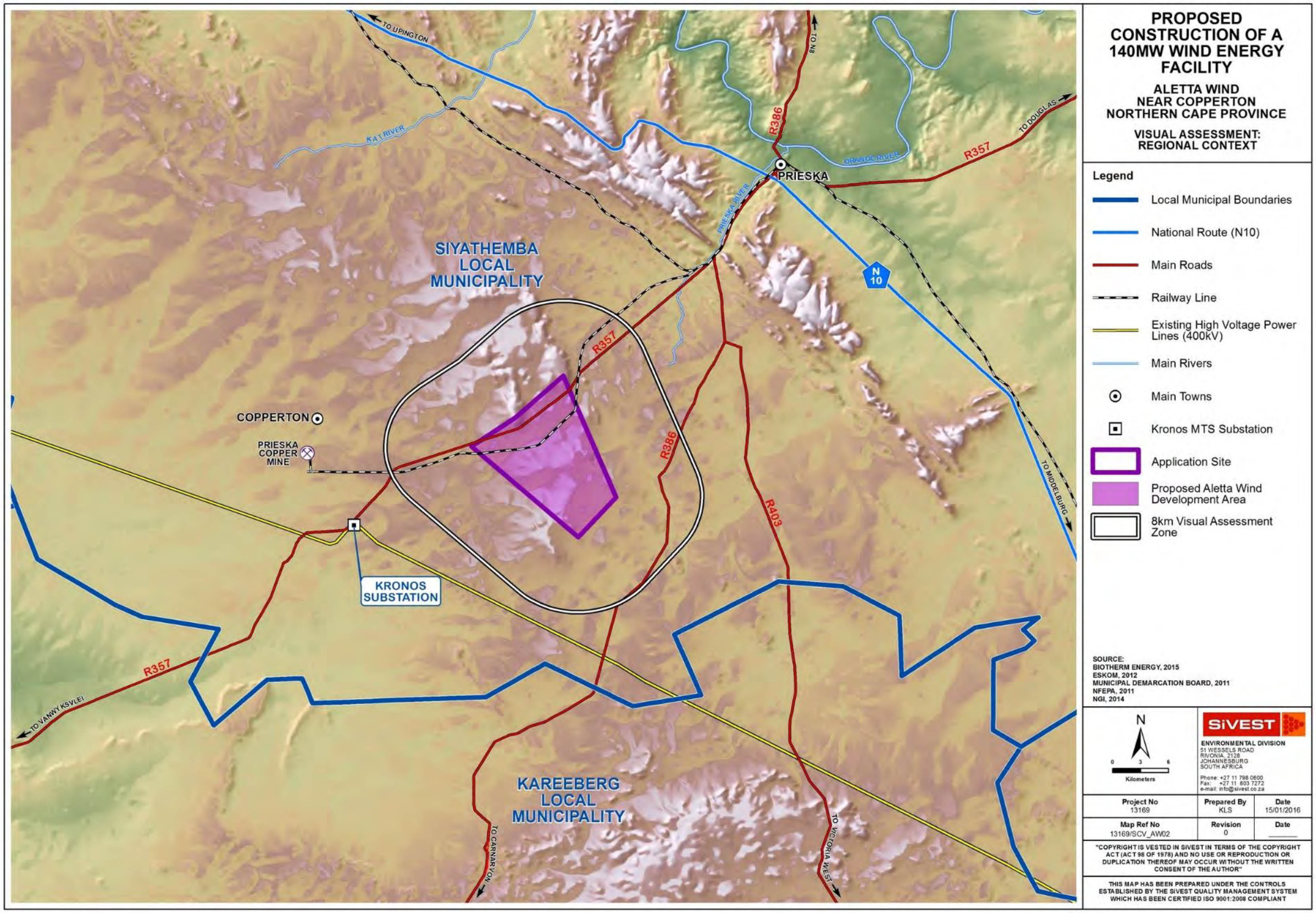


Figure 3: Regional Context Map

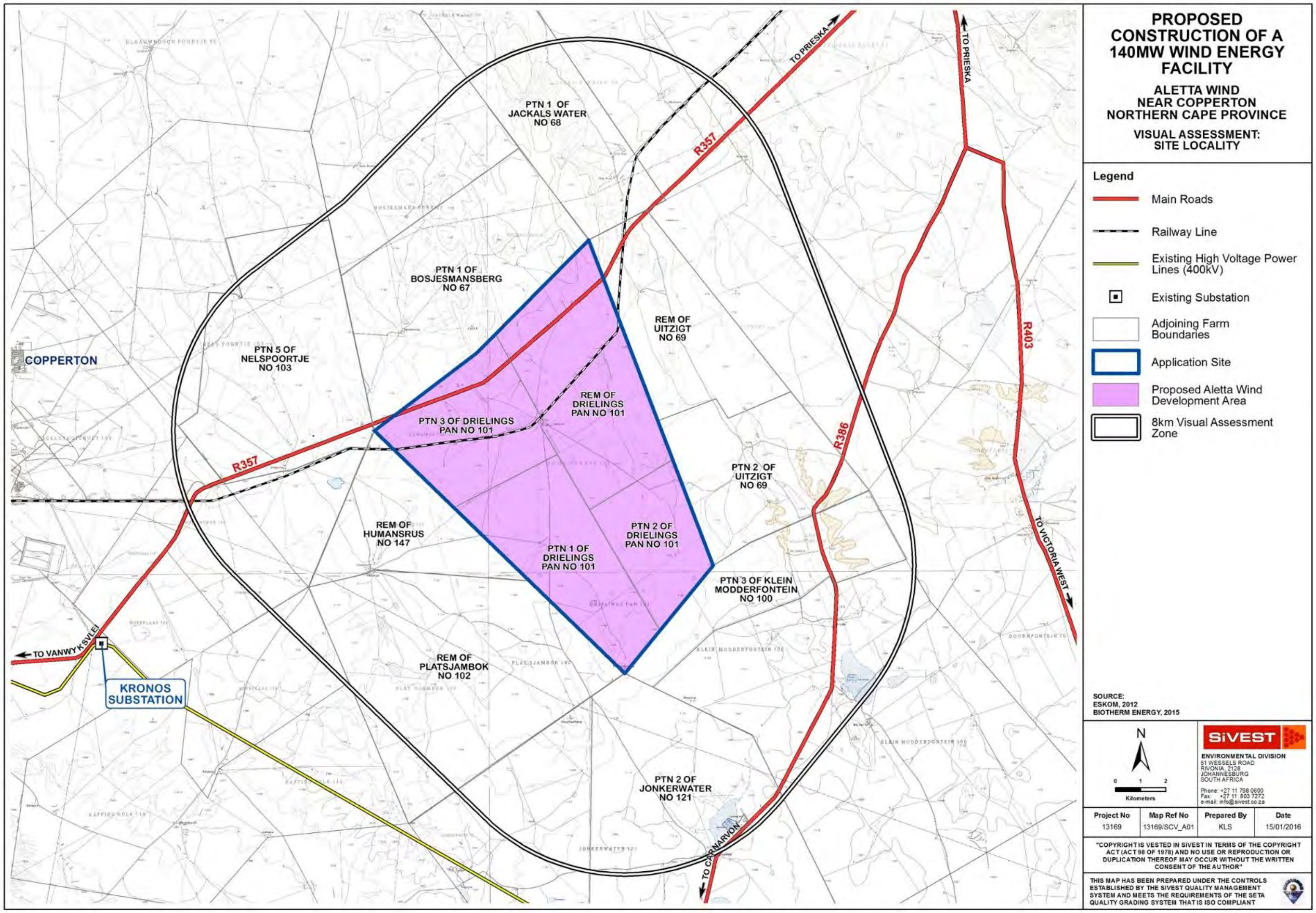


Figure 4: Locality Map

1.3 Assumptions and Limitations

- This scoping phase VIA has been undertaken at a desktop-level. Topographical maps and Google Earth imagery were used to identify potential receptors within the study area. A number of broad assumptions have been made in terms of the visual intrusion of the proposed wind energy facility from each receptor location and the sensitivity of the receptor to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the type of receptor location and its standard use, which could not be established at a desktop level.

- Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass a zone of 8km from the proposed wind energy facility – i.e. an area 8km from the wind energy facility's development areas. This area was assigned as distance is a critical factor when assessing visual impacts and beyond 8km the wind energy facility may still be visible; however the degree of visual impact would diminish considerably and thus the need to assess the impact on potential receptors beyond this distance would not be warranted.

- Due to the varying scales and sources of information as well as the fact that only 20m contours were available to establish the Digital Terrain Model (DTM); maps and visual models may have minor inaccuracies. As such, only large scale topographical variations have been taken into account and minor topographical features or small undulations in the landscape may not be depicted on the DTM.

- No feedback regarding the visual environment has been received from the public participation process to date, however any feedback from the public during the review period of the Draft Scoping Report (DSR) will be incorporated into further drafts of this report.

- No ground-truthing was undertaken for this study. As such, the visual sensitivity of each receptor location was not investigated and this will need to be further explored in the next phase of the study.

- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting required. The night-time environment in the study area was not characterised and will need to be assessed in the next phase of this study.

- This scoping phase visual assessment focused on the proposed development site. The layout of the development within the application site was not taken into account as it was not available at the time of writing this report. As such, no visualisation modelling or three dimensional simulations have been compiled. This will be undertaken in the next phase of the study, should the need be proven by stakeholder / I&AP feedback.

1.4 Assessment Methodology

As mentioned above, this scoping level VIA has been undertaken at a desktop-level. In the first stage of the study the visual environment of the study area was characterised based on a number of factors such as land use, topography and vegetation cover, to provide an assessment of the area's visual character, and the potential of the area to absorb the visual impacts. Digital information from spatial databases such as National geo-spatial information (NGI) and South African National Biodiversity Institute (SANBI) were sourced to provide information on land use and vegetation cover in the study area.

The potential visual issues associated with the proposed wind energy facility were determined based on the characterisation of the visual environment and inherent visual sensitivity of the area. Receptor locations and routes that are potentially sensitive to the visual intrusion of the proposed wind energy facility were also identified, in order to ascertain if a more focussed assessment needs to be undertaken in the next phase of the EIA.

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process will be used to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative. Although I&APs have not as yet provided any feedback in this regard, the report will be updated to include relevant information as and when it becomes available.

2 FACTORS INFLUENCING VISUAL IMPACT

2.1 Subjective experience of the viewer

The perception of the viewer/receptor toward an impact is highly subjective and involves 'value judgements' on behalf of the receptor. It is largely based on the viewer's perception and is usually dependent on the age, gender, activity preferences, time spent within the landscape and traditions of the viewer (Barthwal, 2002). This is important, as certain receptors may not consider the wind energy facility to be a negative visual impact as it is often associated with employment creation, social upliftment and the general growth and progression of an area, and could even have positive connotations.

2.2 Visual environment

Wind energy facility developments are likely to be perceived as visually intrusive in areas that have a natural scenic quality and where tourism activities, based upon the enjoyment of or exposure to the scenic or aesthetic character of the area, are practiced. Residents and visitors to these areas may regard the wind energy facility to be an unwelcome intrusion, which degrades the natural character and scenic beauty of the area, and which would potentially even compromise the practising of tourism activities in the area. Wind energy facilities are not features of the natural environment, but are rather a representation of human (anthropogenic) alteration. Thus when placed in a largely natural landscape, they could be perceived to be highly incongruous in this context.

The presence / existence of other anthropogenic objects associated with the built environment may not only obstruct views but also influence the perception of whether a development is a visual impact. In industrial areas where structures, buildings and other infrastructure exist, the visual environment could be considered to be 'degraded' and thus the introduction of a wind energy facility into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible. In this case value may not be placed on the aesthetic quality of the landscape, and the wind energy facility may not necessarily be considered to be visually intrusive.

2.3 Type of visual receptor

Visual impacts can be experienced by different types of receptors, such as people driving along roads, or people living / working in the area in which the wind energy facility would be visible. The receptor type in turn affects the nature of the typical 'view', with views being permanent in the case of a residence or other place of human habitation, or transient in the case of vehicles moving along a road. The nature of the view experienced affects the intensity of the visual impact experienced.

It is important to note that visual impacts are only experienced when there are receptors present to experience this impact; thus in the context where there are no human receptors or viewers present there are not likely to be any visual impacts experienced.

2.4 Viewing distance

Viewing distance is a critical factor in the experiencing of visual impacts, as beyond a certain distance, even large developments tend to be much less visible, and difficult to differentiate from the surrounding landscape. The visibility of an object is likely to decrease exponentially as one moves away from the source of impact, with the impact at 1000m being a quarter of the impact at 500m away (**Figure 5**). At 5000m away or more, the impact would be negligible (Hull, R.B., et al: 1998).

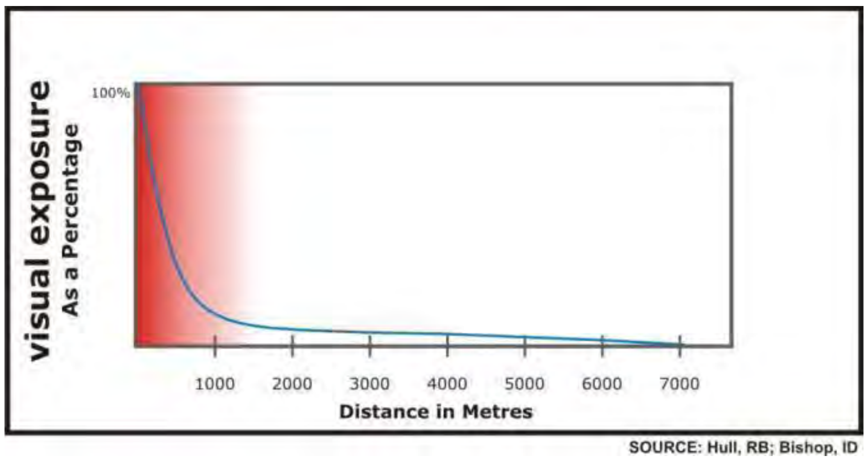


Figure 5: Diagram illustrating diminishing visual exposure over distance

3 VISUAL CHARACTER AND SENSITIVITY OF THE STUDY AREA

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured according to this visual baseline by establishing the degree to which the development would contrast or conform with the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

3.1 Physical and Land Use Characteristics

3.1.1 Topography

The topography within and in the immediate vicinity of the proposed application site is characterised by a flat to gently undulating landscape (typical of much of the Karoo), that gently slopes down in a south-easterly direction.

In addition, the topography in the wider visual assessment zone is characterised by a mix of level plains with some relief, as well as areas of slightly more undulating relief, including some plains with open hills or ridges (**Figure 6**). In the wider area beyond the boundaries of the visual assessment zone, a low mountain range marks a change in topography; with the Doringberge forming a line of hills to the north-east of the application site.

<u>Visual Implications</u>

The largely flat terrain that occurs within the immediate vicinity of the application site results in generally wide-ranging vistas throughout the study area. There are however exceptions to this generally flat topography which include the Dorinberge mountain range located to the north-east of the site, as well as the open hills or ridges located to the north. . The Doringberge are situated approximately 24km from the application site and enclose the visual envelope. However, these mountains are located beyond the visual assessment zone and would offer very little topographical shielding/screening to lessen the impact of the wind energy facility from locally-occurring receptor locations. As these hills lie between Prieska and the site, they are a contributing factor in potentially shielding Prieska from the proposed development, although Prieska is situated at a distance from where the impact of the development is likely to be negligible.

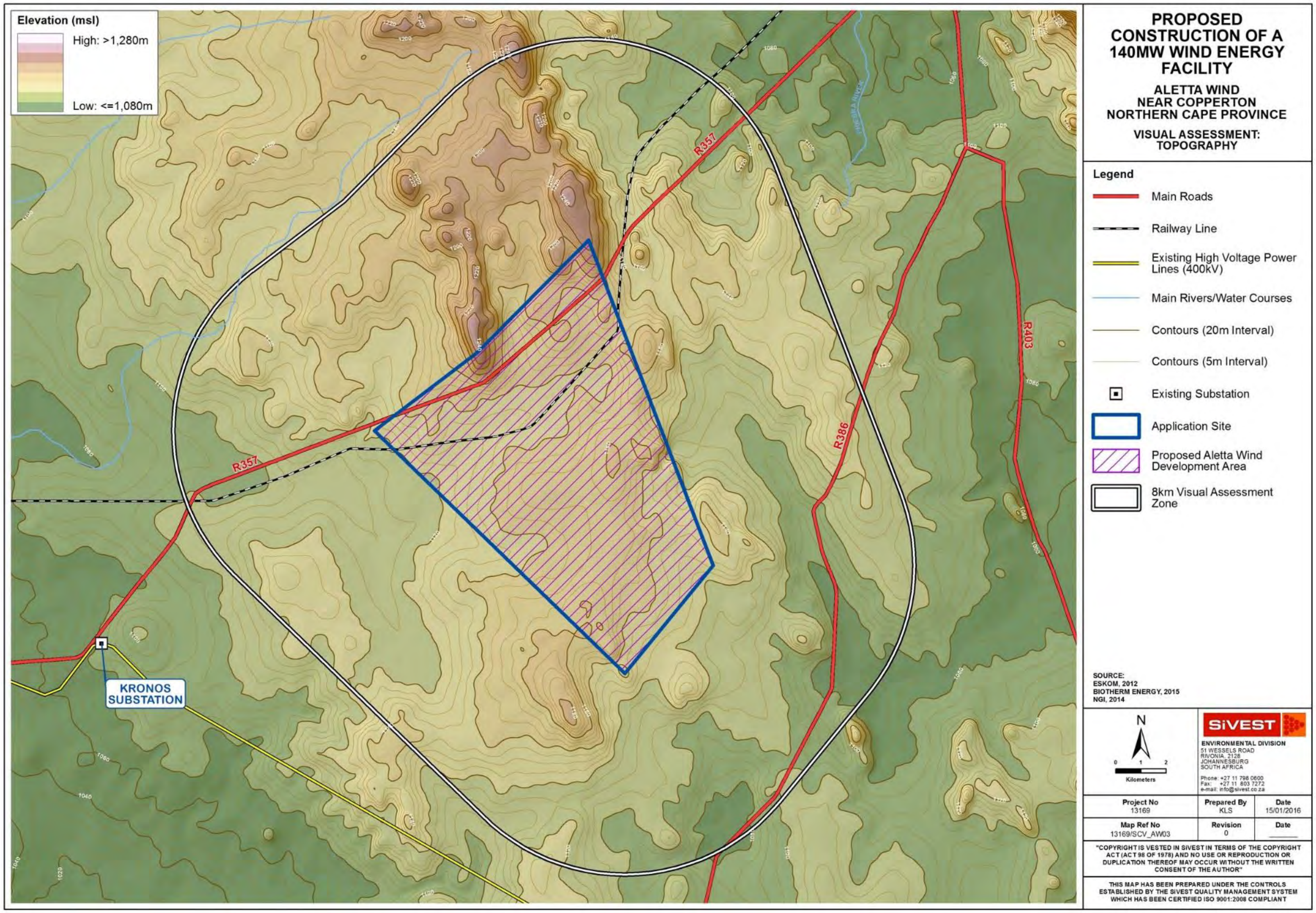


Figure 6: Topography Map

3.1.2 Vegetation

The majority of the application site and visual assessment zone falls within the Bushmanland Arid Grassland vegetation unit. However, sections of the Lower Gariep Broken Veld vegetation unit can also be found in the north of the visual assessment zone and extend slightly into the north of the application site. In addition, parts of the visual assessment zone also appear to fall within the Bushmanland Vloere, Northern Upper Karoo, Upper Karoo Hardeveld and Bushland Basin Shrubland vegetation units. Small sections to the north-east, south-east and south of the application site respectively fall within the Bushmanland Vloere vegetation unit. A relatively large segment of the Northern Upper Karoo vegetation unit is found to the south-east of the application site while a very small section can also be found to the south of the site. In addition, a very small section of the visual assessment zone to the south-east of the application site falls within the Upper Karoo Hardeveld vegetation unit while another section to the south-west of the application site falls within the Bushland Basin Shrubland (**Figure 7**).

According to Mucina and Rutherford (2006), the landscape of the Bushmanland Arid Grassland vegetation unit is characterised by extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semi desert 'steppe'. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

The Lower Gariep Broken Veld vegetation unit is characterised by hills and low mountains, slightly irregular plains but with some rugged terrain with sparse vegetation dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs. Groups of widely scattered low trees such as *Aloe dichtoma* var. *dichtoma* and *Acacia mellifera* subsp. *detinens* occur on slopes of 'koppies' and on sandy soils of foot slopes respectively.

The Bushmanland Vloere vegetation unit is characterised by 'Vloere' (salt pans) of the central Bushmanland Basin as well as the broad riverbeds of the intermittent Sak River (functioning as temporary connection between some of the pans) as well as its numerous ancient (today dysfunctional) tributaries. The patches of this vegetation unit are embedded especially within the Bushmanland Basin Shrubland and Bushmanland Arid Grassland vegetation units, and to a lesser extent also within the Bushmanland Sandy Grassland, Western Upper Karoo, Upper Karoo Hardeveld vegetation units as well as marginal Succulent Karoo units summarised within the bioregion of Trans-Escarpment Succulent Karoo.

The vegetation that occurs within the Northern Upper Karoo vegetation unit includes shrubland dominated by dwarf Karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). The landscape is characterised by flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the north-east and with many interspersed pans.

The Upper Karoo Hardeveld is characterised by steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as *Aristida*, *Eragrostis* and *Stipagrostis*.

The landscape of the Bushland Basin Shrubland vegetation unit is characterised by slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum, Salsola*, *Pentzia*, *Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also by abundant annuals such as species of Gazania and *Leysera*.

The aridity of the area has restricted the vegetation cover to this typically short scrub-type vegetation. Relatively large tree species such as the Black thorn (*Acacia mellifera* subsp. *detinens),* as well as some other low trees can however also be found within certain parts of the study area. In other parts, man has had an impact on the natural vegetation, especially around farmsteads, where over many years tall exotic trees and other typical garden vegetation have been established.

<u>Visual Implications</u>

The natural short scrub-like vegetation cover which dominates most of the application site and visual assessment zone is not expected to offer any significant visual screening. Sections of the visual assessment zone are however characterised by relatively large tree species such as the Black thorn (*Acacia mellifera* subsp. *detinens),* as well as some other low trees. These above-mentioned trees occur naturally in certain areas of the visual assessment zone and are expected to contribute to the overall natural character of the study area as well as provide some form of screening from the proposed development. In addition, tall exotic trees may also effectively screen the proposed development from farmhouses, where these trees occur in close proximity to the farmhouse and are located directly in the way of views toward the development..

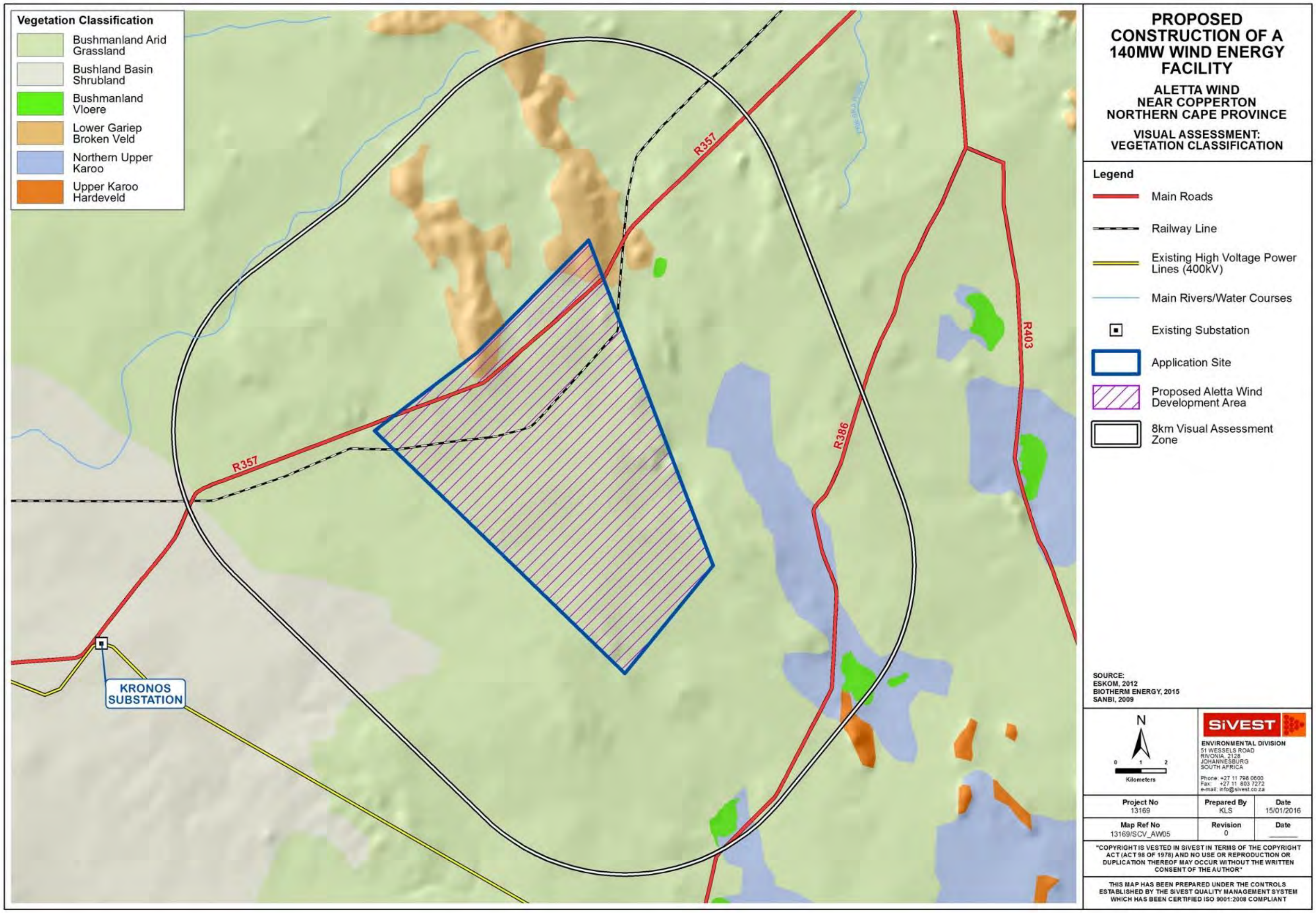


Figure 7: Vegetation Classification Map

3.1.3 Land Use

Much of the assessment area is characterised by natural unimproved vegetation which is dominated by low shrubland (**Figure 8**). The highly arid nature of the area's climate has resulted in livestock rearing dominating being the dominant activity within the area. As such, the natural vegetation has been retained across the vast majority of the study area.

The nature of the climate and corresponding land use has also resulted in low stocking densities and relatively large farm properties across the area. Therefore the majority of the area is very sparsely populated, and relatively little human-related infrastructure exists.

Built form in areas where livestock rearing occurs is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines, fences and the remnants of disused workers' dwellings. It must also be noted that the R357 and R386 gravel roads traverse the northern and south-eastern sections of the study area respectively. In addition, a railway line also traverses the northern section of the study area.

The closest built-up areas include the small mining town of Copperton as well as the old Prieska Copper Mine which was closed in 1996. Copperton is located approximately 15km to the north-west of the application site while the old Prieska Copper Mine is located approximately 14km west. Within the above-mentioned parts of the study area, greater human influence is visible in the form of mining infrastructure and electricity transmission infrastructure. The infrastructure associated with the now-defunct mine still exists, with the headgear, as well as an old slimes dams being prominent landmarks. However, these built-up areas are situated outside of the visual assessment zone and are therefore not expected to alter the visual character of the study area. Nevertheless, patches of degraded land can be found within the application site, as well as to the south-east, south and west of the site respectively. These areas of degraded land appear to be localised along the R357 and R386 gravel roads, as well as the railway line. In addition, very small areas characterised by cultivation can be found to the south-west and north-east of the application site respectively.

<u>Visual Implications</u>

Sparse human habitation and the predominance of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting. High levels of human transformation and visual degradation only become evident in the vicinity of Copperton and Prieska Copper Mine, both of which are outside the 8km assessment zone.
The sections within the visual assessment zone characterized by cultivation are however expected to give the surrounding area a more pastoral feel. Only in areas further south-east, south and west

respectively (along the R357, R386 and railway line) will the landscape character appear more urban or industrial. The visual impacts associated with the proposed development are expected to be relatively insignificant in these areas that they have been relatively transformed and/or degraded. The infrastructure associated with the Copper Mine is however unlikely to change the visual character of the study area as the relic mine is located outside of the visual assessment zone, has been non-functional for a number of years, and the transformation of the area around the mine is extremely localised. In addition, town of Copperton is also located outside of the visual assessment zone and is therefore also not expected to change the visual character of the study area.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

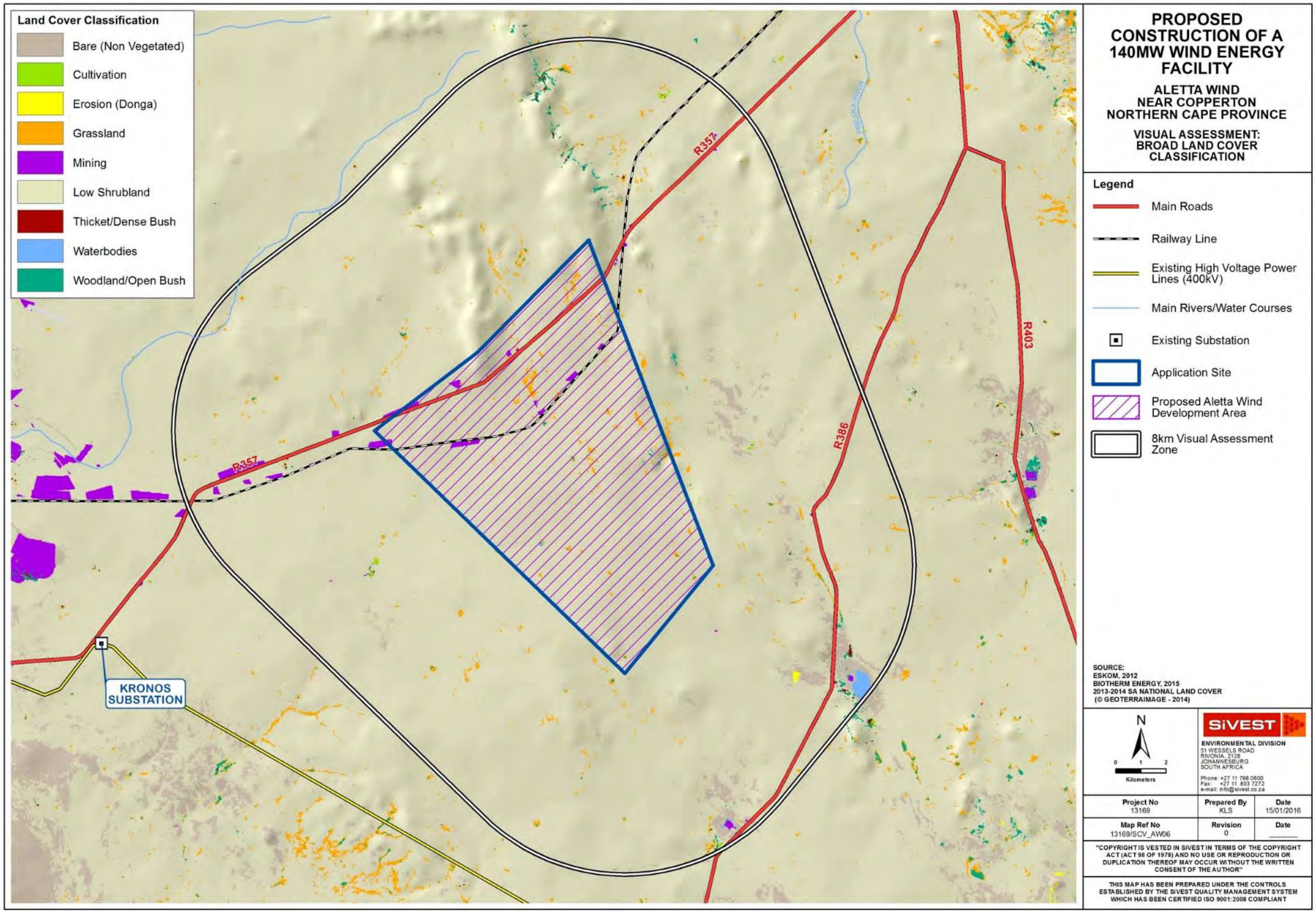


Figure 8: Land Use Classification Map

3.2 Visual Character and Cultural Value

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electrical infrastructure.

Most of the study area is considered to have a rural or pastoral character as a result of the limited human habitation and associated human infrastructural footprint present within the wider study area. The nature of the predominant land use (livestock farming) has retained the natural vegetation and natural appearance of the landscape. Built infrastructure within the study area is limited to isolated farmhouses, gravel access roads, boundary fences, a slimes dam and a railway line which traverses a section of the application site. As previously mentioned, the infrastructure associated with the Copper Mine is unlikely to change the visual character of the study area as the relic mine is situated outside of the visual assessment zone, has been non-functional for a number of years, and the transformation of the area around the mine is extremely localised. In addition, the town of Copperton is also situated outside the visual assessment zone and is therefore not expected to alter the visual character of the study area.

The relatively low density of human transformation throughout majority of the study area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of a wind energy facility as introducing this type of development could be considered to be a degrading factor in this context.

It should however be noted that several wind and solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities, and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area once constructed resulting in a more industrial-type visual character.

The greater area surrounding the proposed development site is also an important component when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this has been changing, with the launching of tourism routes within the Karoo, and the promotion of tourism in this little visited, but large part of South Africa. In a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published "Getaway Guide to Karoo, Namaqualand and Kalahari" (Moseley and Naude-Moseley, 2008). The exposure of the Karoo in the national press during 2011, as part of the debate around the potential for fracking (hydraulic fracturing) mining activities, has brought the natural resources, land use and lifestyle of the Karoo into sharp focus. Many potential objectors stress the need to preserve the environment of the Karoo, as well as preserve the 'Karoo Way of Life', i.e. the stock farming practices which are highly dependent on the use of abstracted ground water (e.g. refer to the Treasure Karoo Action Group website http://treasurethekaroo.co.za/).

The typical Karoo landscape can also be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

According to the Committee's Operational Guidelines; Cultural Landscapes can fall into three categories (UNESCO: 2005).

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small Karoo towns, such as Prieska and Copperton, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

The study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the proposed development of a wind energy facility as introducing this type of development could be considered to be a degrading factor in the context of the natural Karoo character of the study area, as discussed further below.

3.3 Visual Sensitivity

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 2**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as the erection of wind turbines would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors

ii) **Moderate** - Presence of receptors, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 2: Environmental factors used to define visual sensitivity of the study area

FACTORS	**RATING**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pristine / natural character of the environment										
Presence of sensitive visual receptors										

Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' will trigger the need to undertake an assessment of cumulative visual impacts.

Low							**Moderate**							**High**
10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**

Based on the above factors, the study area is rated as having a low visual sensitivity. This is mainly owing to the relatively uninhabited character of the area as well as the presence of degraded land and anthropogenic elements (such as the R357, R386 and the railway line) which would likely reduce the scenic quality of the area. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. As described below, a significant amount of sensitive receptors are present in the study area. Although no formal protected areas or leisure / nature-based tourism activities exist within the study area, the area would still be valued as a typical Karoo cultural landscape.

*Several wind and solar energy facilities are proposed within relatively close proximity to the proposed project. As such, an assessment of the cumulative impact that will be experience from each potentially sensitive receptor will be undertaken in the next phase of this study, once the sensitive receptor locations have been confirmed.

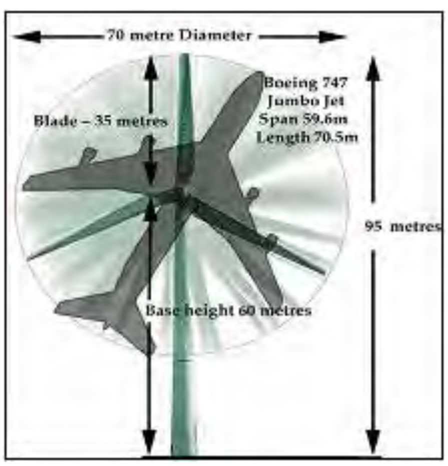
4 TYPICAL VISUAL IMPACT ASSOCIATED WITH THE WIND ENERGY FACILITY

In this section, the typical visual issues / impacts related to the establishment of a wind energy facility are discussed. It is important to note that within a few years several wind energy facilities should be constructed within South Africa. The development and associated environmental assessment of wind energy facilities in South Africa is relatively new, and thus it is valuable to draw on international experience. This section of the report therefore draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with wind energy facilities.

4.1 Wind Energy Facilities

As previously mentioned, at this stage it is anticipated that the proposed project will consist of approximately 80 to 125 wind turbines and associated infrastructure with a total generation capacity of approximately 140MW. The size of the wind turbines will have a hub height of up to 120m and a rotor diameter of up to 150m (approximate in height to a building of 45 storeys). The height of the turbines and the fact that a wind energy facility consists of a series of turbines spaced apart in groups around the site would result in it being typically visible for a large radius.

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a wind energy facility, with potential opposition to a wind energy facility being lower when fewer turbines are proposed (Devine-Wright, 2005). Certain objectors to wind energy facilities also mention the “sky space” occupied by the rotors of a turbine. As well as height, "sky space" is an important issue. “Sky space” refers to the area in which the rotors would rotate. The diagram below indicates that the “sky space” occupied by rotors would be similar to that occupied by a jumbo jet (http://www.stopbickertonwindturbines.co.uk/ - page on visual impact).



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

4.1.1 Shadow flicker

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

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

4.1.2 Motion-based visual intrusion

An important component of the visual impacts associated with wind turbines is the *movement* of the rotors. Labelled as motion-based visual intrusion, this refers to the inclination of the viewer to focus on discordant, moving features when scanning the landscape. Evidence from surveys of public attitudes towards wind energy facilities suggest that the viewing of moving blades is not necessarily perceived negatively (Bishop and Miller, 2006). The authors of the study suggest two possible reasons for this; firstly when the turbines are moving they are seen as being ‘at work’, doing good and producing energy. Conversely, when they are stationary they are regarded as a visual intrusion that has no evident purpose. More interestingly, the second theory that explains this perception is related to the intrinsic value of wind in a certain areas and how turbines may be an expression or extension of an otherwise ‘invisible’ presence.

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

4.2 Associated Infrastructure

The infrastructure associated with the proposed Aletta Wind Energy Facility will include the following:

- A new 132kV on-site Aletta substation and associated infrastructure which will be used to connect the wind energy facility to the national network system in order to export the generated electricity to the National grid. The footprint of the on-site substation yard will be approximately 6.25 hectares. The connection from the on-site Aletta substation to the turbines will be via medium voltage cables as discussed below.
- Medium voltage cables up to 1.5m deep connecting all wind turbines to the on-site Aletta 132kV substation;
- Internal access roads between 4m and 6m wide with a total length of up to 60km. This will include the net load carrying surface excluding any V drains that might be required;
- Double width roads will be required in strategic places for vehicle passing;
- A temporary construction lay-down area of approximately 2 400m^2 (60m x 40m). The lay-down / staging area will be approximately 11250m^2 whilst the lay-down area for the concrete towers (only if required) will be approximately 40000m^2;
- Operation and maintenance (O&M) buildings with a footprint of approximately 300m^2, including an on-site spares storage building, a workshop and an operations building. The operation and maintenance buildings will be situated in close proximity to the wind energy facility substation due to requirements for power, water and access; and
- Fencing (if required) of up to 5m where required. This will be either mesh or palisade.

The proposed on-site Aletta 132kV substation is considered to be a large object and will typically be visible for great distances. As previously mentioned, the wind turbines will be connected to the proposed on-site Aletta 132kV substation using buried medium voltage cables. However, overhead power lines may also be used where a technical assessment of the proposed design suggests that they will be more appropriate, such as over rivers and gullies. Overhead power lines consist of a series of tall towers thus making them highly visible. Like wind turbines, power lines and substations are not features of the natural environment, but are representative of human (anthropogenic) alteration. Thus when placed in largely natural landscapes, they will be perceived to be highly incongruous in this setting. Conversely, the presence of other anthropogenic objects associated with the built environment, especially other power lines or switching substations, may result in the visual environment being considered to be 'degraded' and thus the introduction of a new power line into this setting may be less of a visual impact than if there was no existing built infrastructure visible.

Other proposed infrastructure may also be associated with visual impacts. As previously mentioned, the wind turbines are inter-connected with a series of cables, which are likely to be buried (up to a 1.5m depth), but which also may take the form of above-ground power lines if deemed necessary. These cables may become a visual intrusion if placed in areas of the site that are visible to the surrounding areas, especially those areas that are located on low ridges and associated sloping ground. A trench dug for the cable (both during construction and post-construction once the trench has been back-filled) may become prominent if it creates a linear feature that contrasts with the surrounding vegetation.

A similar principle exists with respect to any access roads constructed in visible areas of the site. Roads are likely to be wider than cable trenches and thus could be even more greatly visible than the cable servitude. Cutting a 'terrace' into a steep side slope would increase the visibility and contrast the road against the surrounding vegetation.

Lastly, buildings placed in prominent positions such as on ridge tops may also break the natural skyline, drawing the attention of the viewer.

The visual impact of the associated infrastructure is generally not regarded to be a significant factor when compared to the visual impact associated with wind turbines. They would however, magnify the visual prominence of the development if located on ridge tops or flat sites in natural settings where there is limited tall wooded vegetation present to conceal the impact.

5 SENSITIVE VISUAL RECEPTORS

A sensitive receptor location is defined as a location, from where receptors would potentially be adversely impacted by a proposed development. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. As described above, the adverse impact is often associated with the alteration of the visual character of the area in terms of the intrusion of the wind energy facility into a 'view', which may affect the 'sense of place'. The identification of sensitive receptors is typically undertaken based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites / routes that are valued for their scenic quality and sense of place;

- the presence of homesteads / farmsteads in a largely natural settings where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed wind energy facility may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities, scenic sites and residential dwellings in natural settings.

Distance bands were used to assign zones of visual impact from the proposed development site, as the visibility of the development would diminish exponentially over distance (refer to section 2.4 above). As such, the proposed development would be more visible to receptors located within a short distance and these would experience a higher adverse visual impact than those located at a moderate or long distance from the proposed development.

Based on the height and scale of the project, the radii chosen to assign these zones of visual impact are as follows:

- 0 < 2km (high impact zone)
- 2 < 5km (moderate impact zone)
- 5km < 8km (low impact zone)

A total number of nineteen (19) scattered farmsteads / homesteads which are used to house the local farmers as well as their farm workers were identified within the study area. These dwellings are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these dwellings. The degree of visual impact experienced will vary from one inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area.
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape).
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

Table 3 below provides details of the potentially sensitive visual receptor locations that were identified within the study area.

Table 3: Visual receptor locations potentially sensitive to the proposed Aletta Wind Energy Facility

Name	Distance from the proposed Aletta Wind development area	Visual Impact Zone
Bosjesmansberg Farmstead 1	Approximately 2.4km	Moderate
Nelspoortje Farmstead 1	Approximately 3.8km	Moderate
Nelspoortje Farmstead 2	Approximately 3.9km	Moderate
Humansrus Farmstead	Approximately 4.2km	Moderate
Uitzigt Farmstead 1	Approximately 3.2km	Moderate
Uitzigt Farmstead 2	Approximately 4.6km	Moderate
Jackalswater Farmstead 1	Approximately 6.4km	Low
Jackalswater Farmstead 2	Approximately 6.6km	Low
Jackalswater Farmstead 3	Approximately 2.7km	Moderate
Jackalswater Farmstead 4	Approximately 3.5km	Moderate
Platsjambok Farmstead	Approximately 4.1km	Moderate
Klein Modderfontein Farmstead 1	Approximately 3.1km	Moderate
Klein Modderfontein Farmstead 2	Approximately 5.5km	Low
Drielingspan Farmstead 1	Inside Aletta Wind application site	High
Drielingspan Farmstead 2	Inside Aletta Wind application site	High
Drielingspan Farmstead 3	Inside Aletta Wind application site	High
Drielingspan Farmstead 4	Inside Aletta Wind application site	High
Drielingspan Farmstead 5	Inside Aletta Wind application site	High
Drielingspan Farmstead 6	Inside Aletta Wind application site	High

**Drielingspan Farmsteads 1, 2, 3, 4, 5 and 6 are located within the proposed Aletta Wind application site. It is assumed that the occupants would have a vested interest in the development and would therefore not perceive the proposed wind energy facility in a negative light. This will be verified during the EIA phase.*

In many cases, roads, along which people travel, are regarded as sensitive receptors. The closest roads to the Aletta Wind application site are the R357, R386 and R403 gravel roads. The R357 traverses the northern section of the application site whereas the R386 can be found to the south-east of the site, where it traverses the south-eastern corner of the visual assessment zone. The R403, on the other hand, is located outside of the visual assessment zone and is not regarded as a sensitive receptor road. The R357 and R386 roads are however also not considered to be sensitive receptor roads as they are used almost exclusively as a local access roads, with very little use for any other purposes. As previously mentioned, the area is not associated with any particular scenic value or any other tourism use. In addition, the R357 passes close to the now disused Copperton Mine and associated slimes dam, as well as Kronos Substation. Certain areas along these roads can therefore be considered to be visually ‘degraded’ by a prevalence of large human infrastructure, and are highly unlikely to be associated with any visual sensitivity.

It must also be noted that the N10 national road passes close by the town of Prieska and connects Port Elizabeth (on the Eastern Cape) to the Namibian border. Prieska is therefore often used as a stopover destination by tourists or vacationers travelling to Namibia or other parts of the Northern Cape. Despite this, the road is not expected to be a potentially sensitive receptor road as it is located a great distance from the visual assessment zone. There are therefore no visually sensitive roads that can be found within the visual assessment zone.

The potentially sensitive visual receptor locations in relation to the zones of visual impact are indicted in **Figure 9** below.

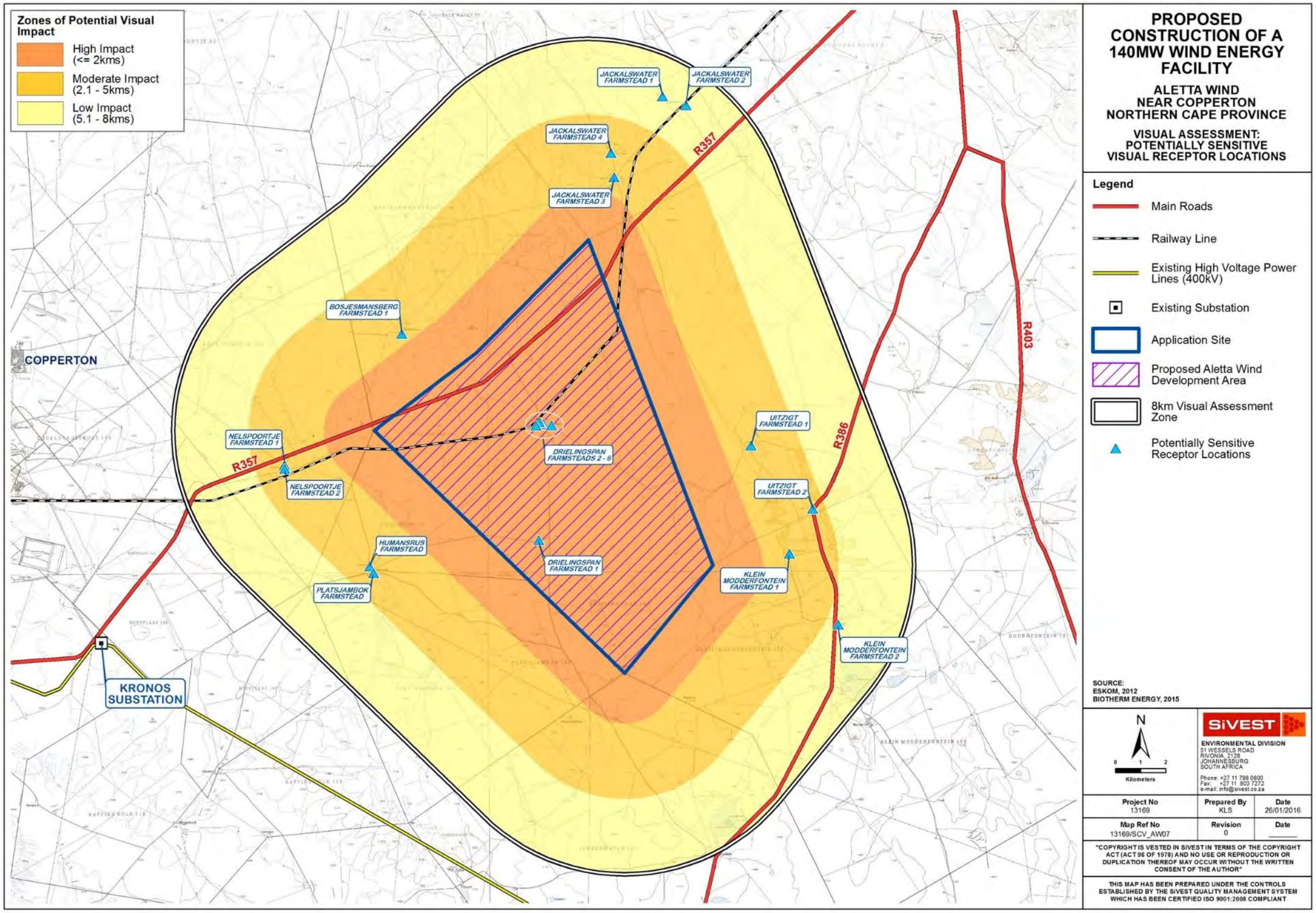


Figure 9: Potentially Sensitive Visual Receptors within the Study Area

6 IDENTIFICATION OF POTENTIAL VISUAL ISSUES

The following potential visual issues / impacts are expected to occur due to the erection of the proposed Aletta Wind Energy Facility on the proposed development site near Copperton:

- The natural visual character of the surrounding area could be altered as a result of numerous proposed wind turbines being erected.
- Locating the wind energy facility on the generally flat terrain, could result in the facility being highly visible for great distances, thus altering the relatively untransformed rural sense of place within the surrounding area.
- The visual intrusion of the proposed development could adversely affect farmsteads / homesteads within the visual assessment zone.
- Vehicles and trucks travelling to and from the proposed site on gravel access roads would increase dust emissions during both the construction and operational phases. The increased traffic on the gravel roads and the resultant dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers.
- Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.
- Security and operational lighting at the proposed wind energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely have a significant impact on the nightscape in these areas. In contrast, introducing light sources into a relatively dark night sky will impact on the visual quality of the area at night. The impact would largely depend on the location of the proposed development in relation to existing light sources, the illumination fixtures utilised and the intensity of the lighting required for the proposed development.

It should also be noted that at this stage, it is anticipated that the proposed development will include the construction of an on-site 132kV substation. The wind turbines of the proposed Aletta Wind Energy Facility will be connected to the above-mentioned on-site substation by underground cables which can be buried up to a depth of 1.5m. Overhead power lines may however be used to connect the wind turbines to the on-site 132kV substation if it is deemed necessary.

At this stage, the following potential visual issues / impacts may occur if the erection of overhead power lines is deemed necessary:

- The proposed power line would introduce a foreign linear element into the landscape which could alter the natural visual character of the surrounding area should these power lines traverse natural areas where other existing infrastructure is not present.
- The visual intrusion of the proposed power line could adversely affect farmsteads / homesteads located in close proximity to the power line in natural settings, where other existing infrastructure is limited. In these natural areas, the power line would contrast with the surrounding area and may change the visual character of the landscape. However, the proposed wind energy facility would significantly alter the visual character once constructed, lessening the visual impact of the proposed power line on surrounding farmsteads.

Each of the above potential visual impacts, identified through this scoping phase visual assessment will be explored in further detail in the EIA phase visual impact assessment. The extent of the visual impact on the identified potentially sensitive farmsteads will need to be confirmed by further assessment.

6.1 Overall Visual Impact Rating

The EIA process requires that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. SiVEST has developed an impact rating matrix for this purpose. The tables below present the impact matrix for visual impacts associated with the proposed construction and operation of the wind energy facility and the associated infrastructure.

Please refer to **Appendix A** for an explanation of the impact rating methodology

6.1.1 Planning

No visual impacts are expected during planning.

6.1.2 Construction

Table 4: Rating of visual impacts of the proposed Aletta Wind Energy Facility during construction

IMPACT TABLE	
Environmental Parameter	Visual Impact

Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed site on gravel access roads are also expected to increase dust emissions. The increased traffic on gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Completely reversible (1)	
Irreplaceable loss of resources	No loss (1)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (negative low)	-20 (negative low)

Mitigation measures	▪ Carefully plan to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads.

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 5: Rating of visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during construction

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction of the underground cables, overhead power lines (if required), on-site 132kV substation, access roads and building infrastructure could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed site on gravel access roads are also expected to increase dust emissions. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.
Extent	Local/district (2)
Probability	Probable (3)
Reversibility	Completely reversible (1)

Irreplaceable loss of resources	No loss (1)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (low negative)	-20 (low negative)
Mitigation measures	▪ All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid. ▪ Carefully plan to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads	

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

6.1.3 Operation

Table 6: Rating of visual impacts of the proposed Aletta Wind Energy Facility during operation

IMPACT TABLE	
Environmental Parameter	Visual Impact

Issue/Impact/Environmental Effect/Nature	The proposed Aletta Wind Energy Facility could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations, such as farmsteads / homesteads, to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the wind energy facility via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed wind energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers	
Extent	Local/district (2)	
Probability	Definite (4)	
Reversibility	Irreversible (4)	
Irreplaceable loss of resources	Marginal (2)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Medium negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	4	4
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	1
Significance rating	-36 (medium negative)	-18 (low negative)
Mitigation measures	▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill.	

	▪ Ensure that dust suppression techniques are implemented on all access roads

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 7: Rating of visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during operation

IMPACT TABLE		
Environmental Parameter	Visual Impact	
Issue/Impact/Environmental Effect/Nature	The proposed underground cables, overhead power lines (if required), on-site 132kV substation, access roads and building infrastructure could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptors to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the infrastructure associated with the wind energy facility via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the associated infrastructure could result in light pollution and glare, which could be an annoyance to surrounding viewers	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Irreversible (4)	
Irreplaceable loss of resources	Marginal loss (2)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative effect (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating

Extent	2	2
Probability	3	3
Reversibility	4	4
Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-34(medium negative)	-15 (low negative)
Mitigation measures	▪ Light fittings for security at the on-site 132kV substation at night should reflect the light toward the ground and prevent light spill. ▪ The operations and maintenance buildings should not be illuminated at night. ▪ If overhead power lines are required, align power lines to run parallel to existing power lines and other linear impacts, where possible. ▪ Bury cables under the ground where possible. ▪ The operation and maintenance building should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads. ▪ Select the alternatives that will have the least impact on visual receptors.	

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

6.1.4 Decommissioning

Visual impacts during the decommissioning phase are potentially similar to those during the construction phase.

7 CONCLUSION

A scoping-level visual study has been conducted to identify the potential visual impact and issues related to the development of the Aletta Wind Energy Facility and associated infrastructure near Copperton in the Northern Cape Province. The study area has a rural or pastoral visual character with a low visual sensitivity. Additionally, the study area is not valued for its tourism significance. However, several wind and solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. The proposed wind energy facility development is likely to visually influence nineteen (19) farmsteads / homesteads identified within the visual assessment zone, therefore these are regarded as potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on a receptors in the study area could be significant.

An overall impact rating was also conducted as part of the scoping phase in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that overall the proposed Aletta Wind Energy Facility is expected to have a low visual impact during construction and a medium visual impact during operation, with relatively few mitigation measures available. In addition, the infrastructure associated with the proposed Aletta Wind Energy Facility would have a low visual impact during construction and a medium visual impact during operation.

Accordingly, further assessment will be required in the EIA-phase to investigate the sensitivity of the receptor locations to visual impacts associated with the proposed development and to quantify the impacts that would result.

7.1 Methodology for Further Assessment

The focus of the EIA phase VIA will be to undertake a more detailed GIS-based assessment, to quantify the magnitude and significance of the visual impacts of the proposed development in both a day-time and night-time context.

This assessment will focus on areas where potential sensitive receptors are located. Should data be available, digital terrain models and viewsheds will be generated for the areas of focus. This analysis will be conducted using ArcGIS software in conjunction with the Spatial Analyst and 3D Analyst extensions where necessary. The assessment will rely on site visits to each potentially sensitive receptor location to identify the extent of visual impact of the proposed wind energy facility from these locations. A further assessment of the intensity of potential visual impact, expressed in terms of bands of differing visual significance will be undertaken. The fieldwork will also allow for the correction and refinement of the baseline information.

The overall significance of visual impacts associated with the proposed wind energy facility will be assessed through a rating matrix. Once this has been undertaken, measures to mitigate potential visual impacts will be identified, and if practical, layout alternatives within the application site will be considered and suggested to minimise visual impact of the proposed development.

A separate rating matrix will be used to assess the visual impact of the proposed development on the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the primary focus / orientation of the receptor, the presence of screening factors, the visual character and sensitivity of the area and the visual contrast of the development with the typical elements and forms in the landscape.

Thereafter, the alternatives will be comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

Interested and Affected Parties will be consulted through the public participation process being undertaken as part of the EIA process, in order to establish how the proposed wind energy facility will be perceived from the various receptor locations and the degree to which this impact will be regarded as negative.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact, as well as a detailed report indicating the findings of the study.

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Appendix A

IMPACT RATING METHODOLOGY

IMPACT RATING METHODOLOGY

The determination of the effect of an environmental impact on an environmental parameter (in this instance, wetlands) is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global) whereas intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in Table ?.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is usually assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

In this case, a unique situation is present whereby various scenarios have been posed and evaluated accordingly. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 1. Example of the significance impact rating table.

NATURE		
Includes a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.

4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects

3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.

6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

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Appendix 6H

Heritage Assessment

BIOTHERM ENERGY (PTY) LTD

WIND ENERGY FACILITY – ALETTA PROJECTS

Heritage Scoping Report

Issue Date: 28 January 2016
Revision No.: 1
Project No.: 13169

Date:	05 03 2015
Document Title:	Heritage Scoping Report – Aletta WEF
Author:	Wouter Fourie
Revision Number:	1
Checked by:	
For:	SiVEST Environmental Division

Executive Summary

PGS Heritage was appointed by SiVEST Environmental Division to undertake a Heritage Scoping Report that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed development of Aletta wind energy facility near Copperton, Northern Cape Province

The Heritage Scoping Report has shown that the proposed Aletta project may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites.

Evaluation of aerial photography has indicated the following area that may be sensitive from an archaeological perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in Table 1.

The heritage sensitivity does not indicate no-go areas in the maps, but rather the possibility of encountering heritage sites that will require further mitigation before construction commence.

Table 1: Landform to heritage matrix

LAND FROM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Dunes	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

These findings provide the basis for the recommendation of further field truthing through an archaeological walk down and palaeontological desktop study covering the site. The aim of this will be to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan as derived from the EIA.

Projected Impact Summary

Table 2 provides a summary of the projected impact rating for this project on heritage resources as derived from Section 4.2-4 of this report.

Table 2: Comparison of summarised impacts on environmental parameters

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Heritage resources	Impact during construction	51		24	
			High Negative Impact		Low Negative Impact

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HERITAGE SCOPING REPORT

Contents Page

Appendices

A: LEGISLATIVE PRINCIPLES
B: HERITAGE IMPACT ASSESSMENT METHODOLOGY
C: IMPACT ASSESSMENT MATRIX

1 INTRODUCTION

PGS Heritage was appointed by SiVEST Environmental Division to undertake a Heritage Scoping Report that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed development of Aletta wind energy facility near Copperton, Northern Cape Province

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites, finds and sensitive areas that may occur in the study area for the EIA study. The Heritage Impact Assessment (HA) aims to inform the Environmental Impact Assessment in the development of a comprehensive Environmental Management Plan to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

PGS Heritage (PGS) compiled this Heritage Scoping Report.

The staff at PGS has a combined experience of nearly 80 years in the heritage consulting industry. PGS and its staff have extensive experience in managing the HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, Project manager for this project, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within the said organisation, as well as being accredited as a Professional Heritage Practitioner with the Association of Professional Heritage Practitioners – Western Cape (APHP).

1.3 Assumptions and Limitations

The aim of the scoping document is to identify the possible types of heritage resources that might be present in the study area, as well as possible hotspots for the locality of such resources.

This report can in no way be seen as the final report and study phase for the EIA project and it assumes that a full ground truthing and survey will be conducted during the EIA phase of the project to identify heritage sites present in the impacted areas.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

i. National Environmental Management Act (NEMA), Act 107 of 1998

ii. National Heritage Resources Act (NHRA), Act 25 of 1999

iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

i) GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998
    a) Basic Assessment Report (BAR) – Regulations 19 and 23
    b) Environmental Scoping Report (ESR) – Regulation 21
    c) Environmental Impacts Assessment (EIA) – Regulation 23
    d) Environmental Management Programme (EMPr) – Regulations 19 and 23
ii) National Heritage Resources Act (NHRA) Act 25 of 1999
    a) Protection of Heritage Resources – Sections 34 to 36; and
    b) Heritage Resources Management – Section 38
iii) Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a) Section 39(3)

The NHRA (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA (Act 25 of 1999) states that "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…" In addition, the NEMA (No 107 of 1998) and the GNR 982 (Government Gazette 38282, 14 December 2014) state that, "the objective of an environmental impact assessment process is to, … identify the location of the development footprint within the preferred site … focussing on the geographical, physical, biological, social, economic, cultural and heritage aspects of the environment" (GNR 982, Appendix 3(2)(c) emphasis added). In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

Refer to **Appendix A** for further discussions on heritage management and legislative frameworks

Table 3: Terminology

Acronyms	***Description***
AIA	Archaeological Impact Assessment
BP	Before present
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
PSSA	Palaeontological Society of South Africa
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

Archaeological resources

This includes:

i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;

ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;

iii. wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;

iv. features, structures and artefacts associated with military history, which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
ii. carrying out any works on or over or under a place;
iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
iv. constructing or putting up for display signs or boards;
v. any change to the natural or existing condition or topography of land; and
vi. any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age, between 700 000 and 2 500 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance, such as the caves with archaeological deposits identified close to both development sites for this study.

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 20 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 20-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

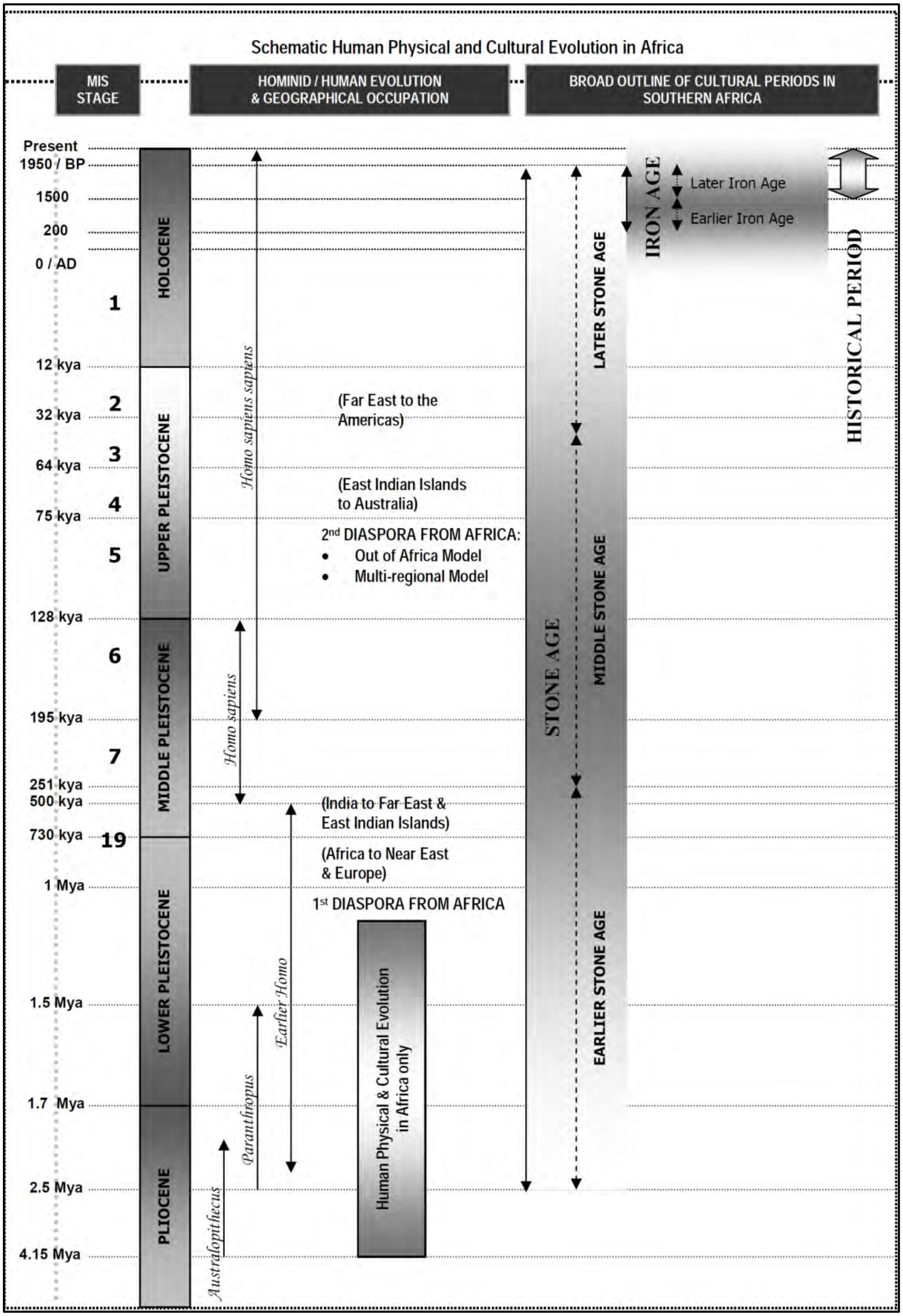

Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

The Aletta Wind facility will be located approximately 15km south-east of Copperton, in the Siyathemba Local Municipality within the Northern Cape Province. The wind development will consist of a 140MW wind facility. Additionally, a 132kV power line and substation will be required to connect the wind facility to the Eskom grid. This will be assessed as part of a separate Basic Assessment (BA). (Figure 2).

The project includes the following farms:

- The whole of the farm Drielings Pan No. 101

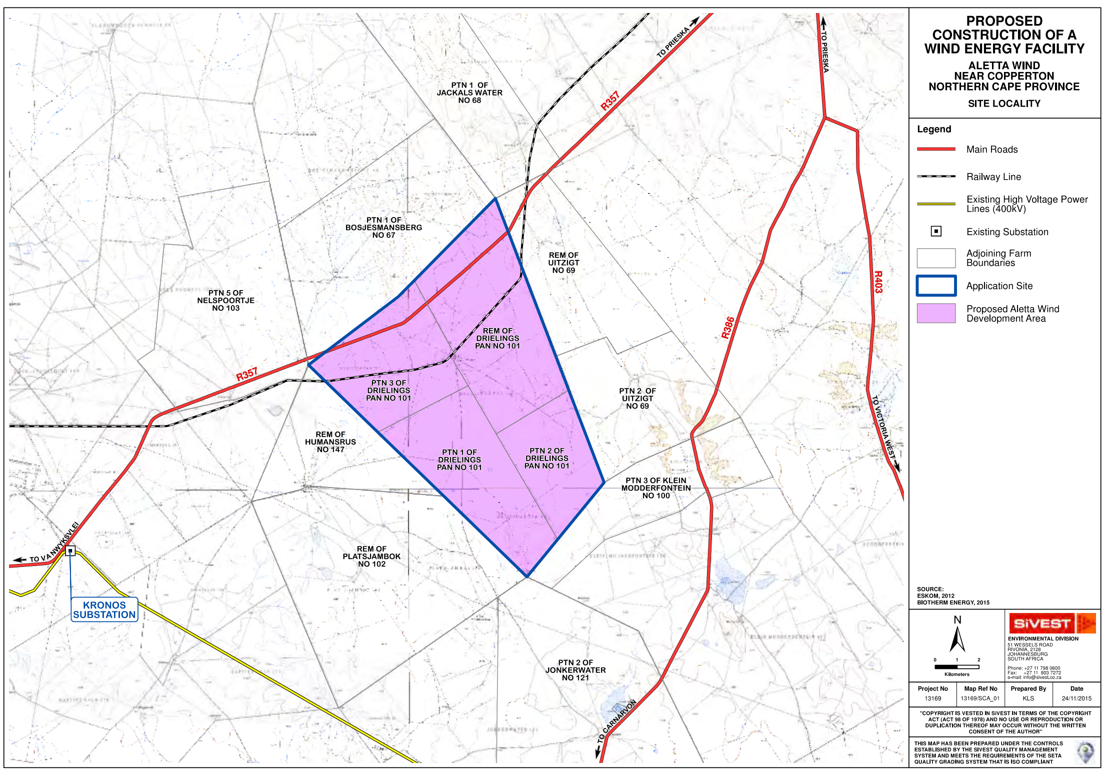

Figure 2 – Aletta WEF Locality

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site significance

PGS Heritage (PGS) compiled this Heritage Scoping Document as part of the Heritage Impact Assessment (HIA) report for the proposed Aletta wind energy facility. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

3.1.1 Scoping Phase

Step I – Literature Review: The background information to the field survey relies greatly on the Heritage Background Research.

3.1.2 Impact Assessment Phase

Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by a qualified archaeologist, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

Appendix B, outlines the Plan of study for the Heritage Impact Assessment process, while **Appendix C** provides the guidelines for the impact assessment evaluation that will be done during the EIA phase of the project.

4 BACKGROUND RESEARCH

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore an Internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

4.1 Previous Studies

Researching the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a number of other archaeological or historical studies have been performed within the wider vicinity of the study area. Previous studies listed for the area in the APM Report Mapping Project included a number of surveys within the area listed in chronological order below:

VAN RYNEVELD, K. 2006. Phase 1 Archaeological Impact Assessment - Vogelstruisbult 104, Prieska District, Northern Cape, South Africa. National Museum Bloemfontein

KAPLAN, J.M. 2010. Archaeological Scoping Study and Impact assessment of a proposed photovoltaic power generation facility in Copperton Northern Cape. Agency for Cultural Resource Management

KAPLAN, J.M. & WILTSHIRE, N. 2011. Archaeological Impact Assessment of a proposed wind energy facility, power line and landing strip in Copperton, Siyathemba municipality, Northern Cape. Agency for Cultural Resource Management

ATWELL, M. 2011. Heritage Assessment Proposed Wind Energy Facility And Related Infrastructure, Struisbult: (Farm 103, Portions 4 And 7), Copperton, Prieska, Atwell & Associates

ORTON, JAYSON. 2012a. Heritage Impact assessment for a proposed photovoltaic energy plant on the farm Klipgats Pan near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town

ORTON, JAYSON. 2012b. Heritage Impact Assessment for a proposed photovoltaic energy plant on the farm Hoekplaas near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town

ORTON, J & WEBLEY, L. 2013. Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on the Remainder of Farm Klipgats Pan 117, Copperton, Northern Cape

Van der Walt, Jaco. 2012. Archaeological Impact Assessment Report for the proposed Garob Wind Energy Facility Project, located close to Copperton in the Northern Cape. Heritage Contracts and Archaeological Consulting CC (HCAC)

FOURIE, W. 2012. Heritage Impact Assessment for the proposed Eskom Cuprum to Kronos Double Circuit 132kv Power line and Associated Infrastructure, Prieska, Northern Cape.

FOURIE, W. 2015. Heritage Impact Assessment for the proposed Helena 1 PV project, Copperton Northern Cape.

FOURIE, W. 2015. Heritage Impact Assessment for the proposed Helena 2 PV project, Copperton Northern Cape.

FOURIE, W. 2015. Heritage Impact Assessment for the proposed Helena 3 PV project, Copperton Northern Cape.

4.1.1 Findings from the studies

Palaeontology

The following map (**Figure 3**) is an extract from the palaeontological desktop study completed by Almond (2013) for the proposed solar project on the farm Bosjesmansberg 67, bordering on the north to the study area. The map indicates the main geological units as:

The main geological units mapped within the study region are:

i) Precambrian basement rocks (igneous / metamorphic): Reddish-brown with dots (Mu) = Uitdraai Formation (Brulpan Group)
ii) Karoo Supergroup sediments: Grey (C-Pd) = Mbizane Formation (Dwyka Group)
iii) Late Caenozoic (Quaternary to Recent) superficial deposits: Pale yellow (Qg) = Gordonia Formation (Kalahari Group)

Almond (2013), indicated that the, "underlain at depth by unfossiliferous Precambrian metasediments as well as by glacial sediments of the Dwyka Group that contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, aeolian sands, soils *etc*) are of low to very low palaeontological sensitivity. The impact significance of the solar facility development, *including* the transmission line options, on local fossil heritage resources is considered to be VERY LOW.

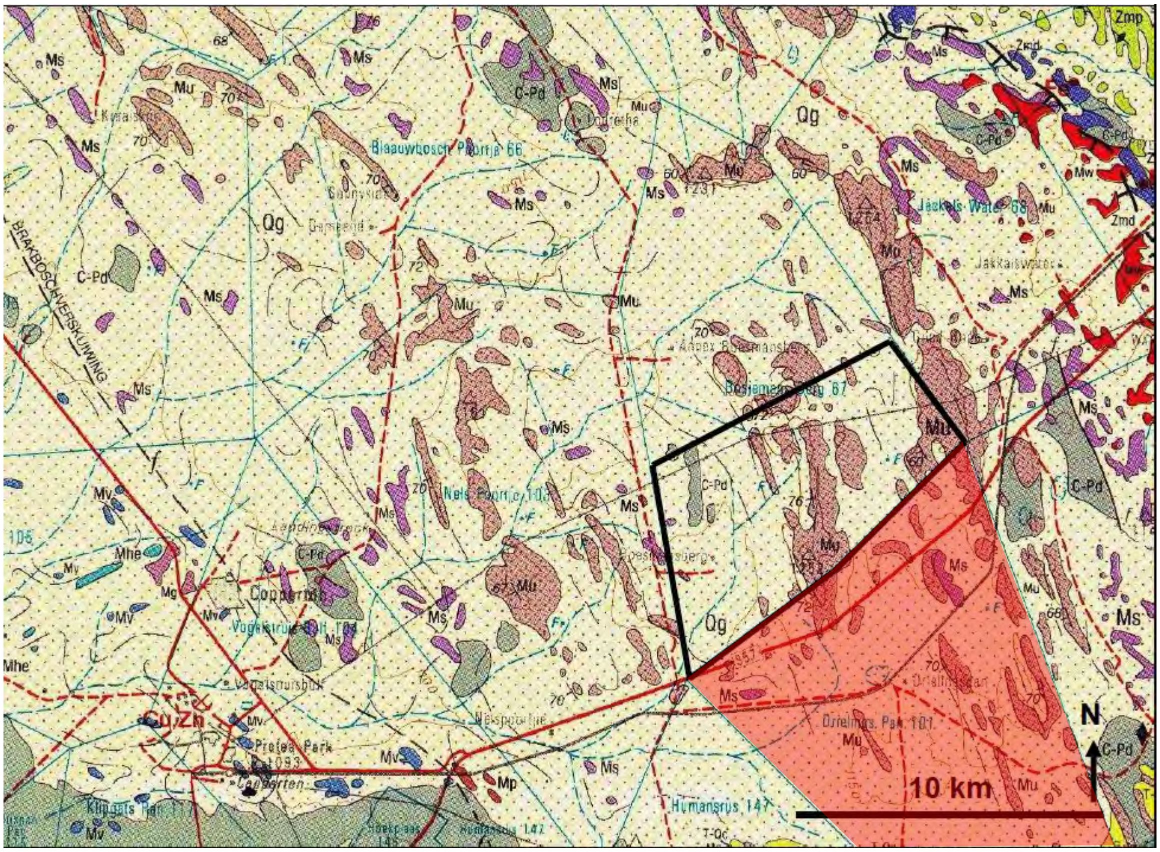

Figure 3 – 1: 250 000 geology sheet 3022 Britstown (Council for Geoscience, Pretoria) (Almond, 2013) The Outline of the current study in red

Archaeology

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003). Evaluation of the alignment has identified possible sensitive areas.

The areas marked in blue and red (Figure 6**)** shows drainage lines and pans in the proposed development areas.

Since September 2011 a large number of Heritage and Archaeological Impact Assessments were completed in the vicinity of the proposed development area **(**Figure 7**)**. Most notably the work of Orton (2011, 2012 and 2013), Kaplan (2010) and Kaplan and Wiltshire (2011) and Van der Walt (2012), has confirmed the statement by Parsons (2003), as noted earlier.

Figure 4 - Early Stone Age stone tools found close to Kronos substation, just west of the study area

Orton (2012) notes that literature has shown that the Bushmanland area is littered by low density lithic scatters, with well weathered Early (ESA) and Middle Stone Age (MSA) artefacts dominating the assemblages. Orton's (2012 and 2013) and Fourie's (2012, 2013, 2015) work on the Klipgats Pan and Hoekplaas, has produced numerous find spots as well as clusters of site located on elevated terraces overlooking pan-like areas (identified as the drainage area as indicated in Figure 7**)**, noted by Orton as being of LSA origin.

Fourie (2015) notes that findspots were mostly characterised by three types of setting, deflated red sands, and pebble concentrations associated with a calcrete exposure and non-deflated red sand exposures in between low-density vegetation.

The findspots varied from Later Stone Age (LSA) scatters consisting of flakes, chips and some cores manufactured from fine-grained quartzite, chalcedony, and cryptocrystalline (ccs) material; Middle Stones Age (MSA) lithics consisting of cores, chips and flakes with a low occurrence of formal tools. The majority of the material utilised were either lideanite that occur in the form of medium sized boulders or round washed pebbles in the area or coarse-grained quartzite that occur as sporadic outcrops.

Earlier Stone Age (ESA) lithics found at some of these finds spots consisted of hand axes, cleavers and large flakes. Most of the lithics were either rolled or heavily weathered with patination evident on 95% of the lithics.

Figure 5 - Close-up view of quartzite flakes and debitage at Kr_Cu/2012/003 (Debitage and lithics indicate by dots) a site situated some 500 meters to the east of the study area (Fourie, 2013)

Kaplan and Wiltshire's (2011) work to the north of the study area has confirmed the presence of Stone Age Sites with a high local significance rating with the sites at Modderpan and Saaipan covering ESA, MAS and LSA finds. A number of knapping occurrences and find spots were also made during the fieldwork.

Van der Walt (2012) indicates that the fieldwork done for the HIA on Bosjesmansberg, adjacent to the study area has shown a high incidence of low density scatters all over the study area. Wiltshire (2011) indicates the presence of round stone built kraals, close or on low rises, that could possibly be associated with herder activity.

4.1.2 Historical structures and history

Some structures identified during map analysis (Figure 6) and needs to be investigated during the Impact Assessment phase.

4.1.3 Heritage sensitivities

The evaluation of the possible heritage resource finds and their heritage significance linked to mitigation requirements was linked to types of landscape. This enabled the development of a heritage sensitivity map (Figure 7). The heritage sensitivity rating does not indicate no-go areas but the possibility of finding heritage significant site that could require mitigation work.

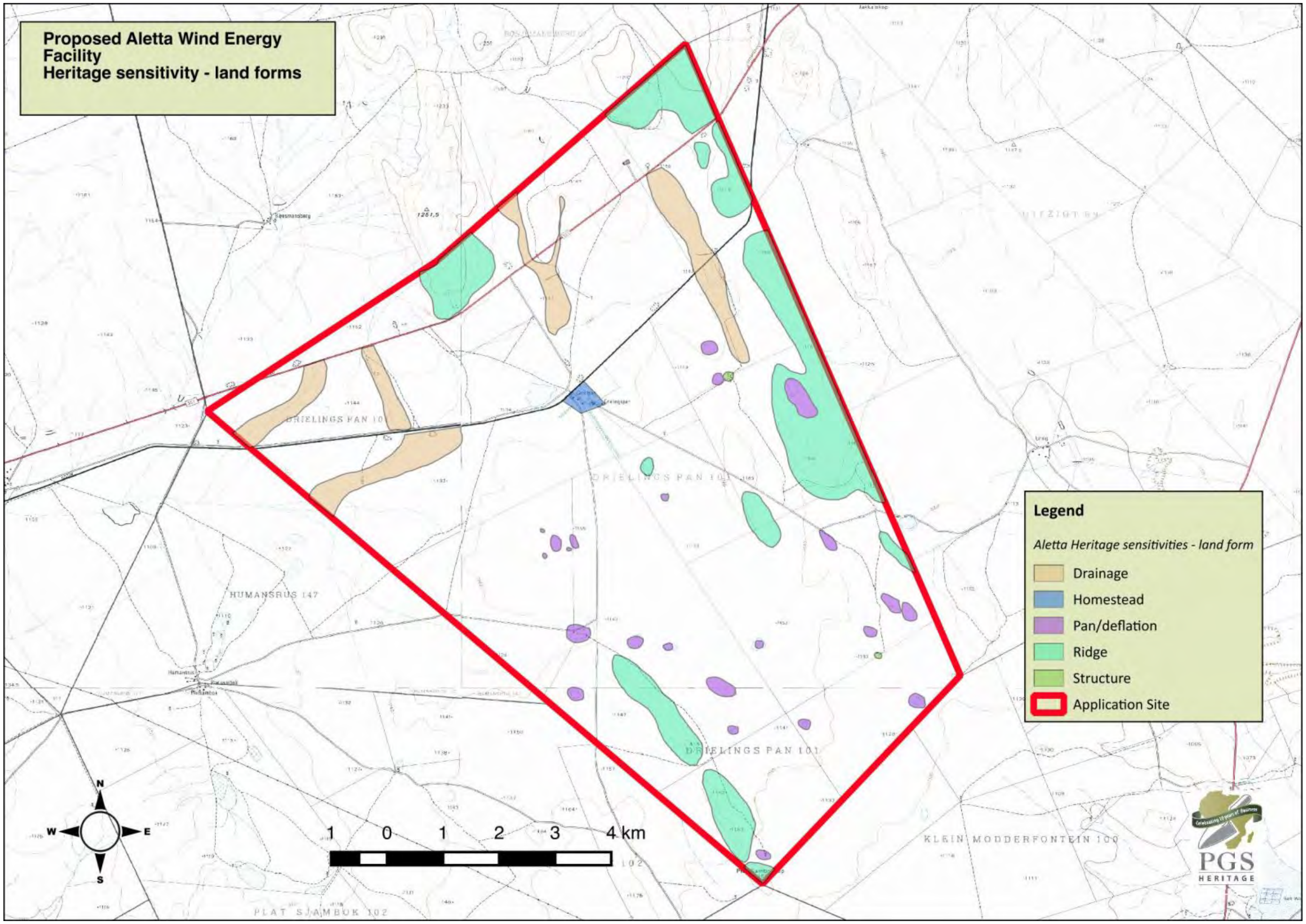

Figure 6 – Landforms linked to heritage resources

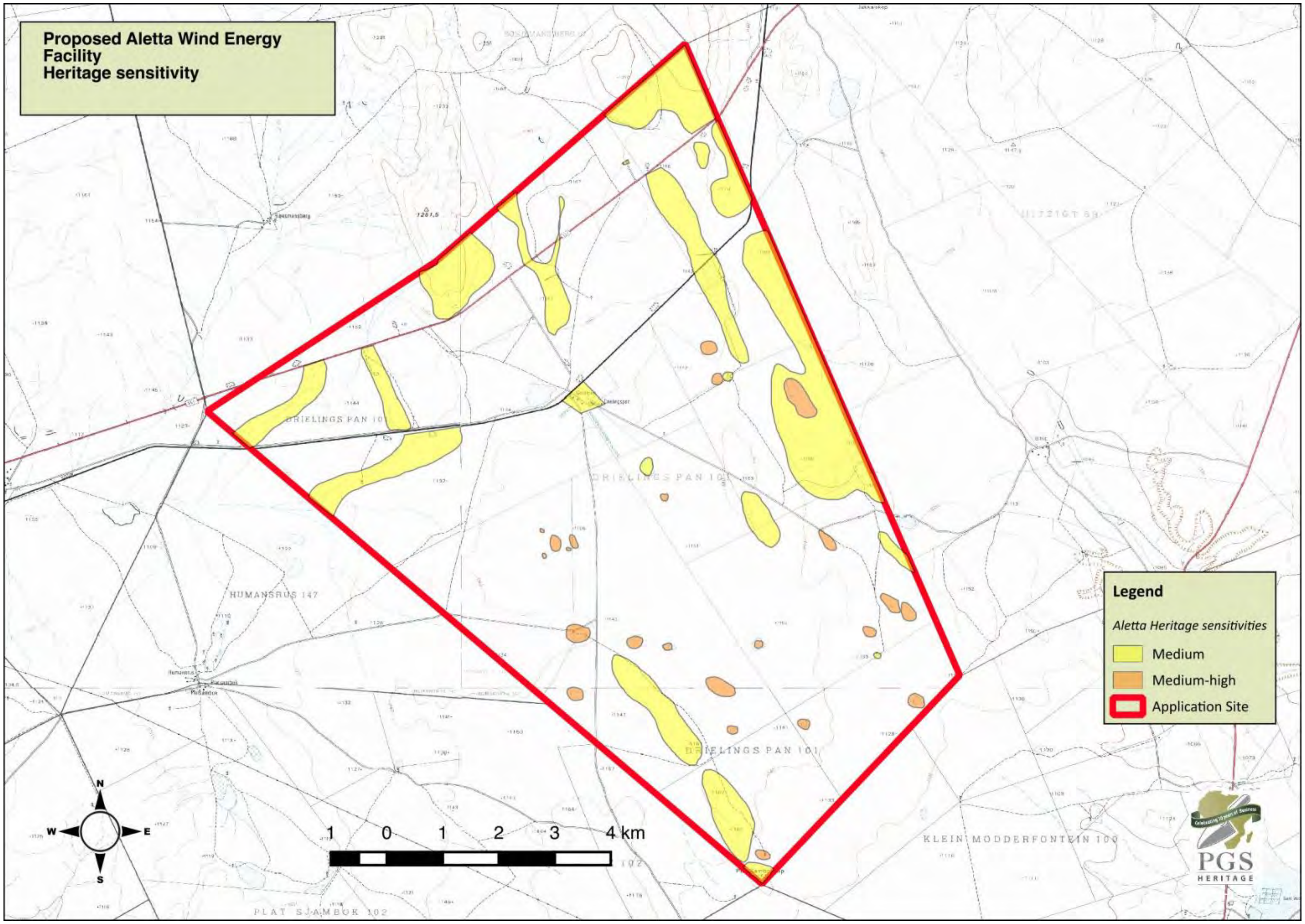

Figure 7 – Possible heritage sensitive areas

4.1.4 Possible finds

Evaluation of aerial photography has indicated the following area that may be sensitive from an archaeological perspective (**Figure 7**). The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 4**.

Table 4: Landform to heritage matrix

LAND FROM TYPE	**HERITAGE TYPE**
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Dunes	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

To be able to compile a heritage management plan to be incorporated into the Environmental Management Plan the following further work will be required for the EIA.

- Archaeological walk through of the areas where the project will be impacting;
- Palaeontological desktop assessment of the areas and selective site visits where required by the palaeontologist;

4.2 Environmental Issues and Potential Impacts

ISSUE	**Impact on archaeological sites**
DISCUSSION	As seen from the archival work and discussion in section 4.1 the possibility of archaeological finds has been identified as being high and thus further field work is required to develop a comprehensive Heritage Management Plan. Finds in studies adjacent to the study area has indicated the need for comprehensive fieldwork.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified archaeological sites and the discovery of such sites during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas
CUMULATIVE	The possible research opportunities due to the discovery of new

EFFECT	archaeological sites and the subsequent mitigation will provide valuable information on the Copperton archaeology.

ISSUE	**Impact on palaeontological sites**
DISCUSSION	The palaeontological potential of the area has been confirmed as being low
EXISTING IMPACT	Site impacted by existing developments such as transmission lines and road networks.
PREDICTED IMPACT	Unidentified palaeontological sites and the discovery of such sites during construction can seriously hamper construction timelines.
EIA INVESTIGATION REQUIRED	Further palaeontological desktop work will be conducted to augment the information for the HIA
CUMULATIVE EFFECT	None foreseen at this stage.

ISSUE	**Impact on historical sites**
DISCUSSION	As seen from the archival work and discussion in section 4.1 the possibility of historical finds have been identified and thus further fieldwork is required to develop a comprehensive Heritage Management Plan.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified historical structure and the discovery of such structures during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas will identify possible impacted sites
CUMULATIVE EFFECT	None foreseen at this stage.

4.3 Projected impact assessment

The fieldwork from previous HIA's and AIA's in the surrounding areas have shown that the study area is characterised by a background scatter of Stone Age artefacts.

It must be kept in mind that this HSR and fieldwork could in no way identify all archaeological sites within the development footprint and as such it was has shown that the possibility of encountering Stone Age archaeological site is extremely high.

The following set of tables provide an assessment of the impact on heritage resources within the development foot print.

Table 5: Rating of impacts – Archaeological sites

IMPACT TABLE	
Environmental Parameter	*Heritage Resources – Archaeological resource*
Issue/Impact/Environmental Effect/Nature	*The possibility of encountering previously unidentified heritage resources and specifically Stone Age archaeological sites. As well as the impact on the identified archaeological sites*
Extent	*Will impact on the footprint area of the development*
Probability	*Fieldwork in the larger area, has shown that such a predicted impact will definitely occur*
Reversibility	*Due to the nature of archaeological sites the impact is seen as irreversible, however mitigation could enable the collection of enough information to preserve the data from such a site*
Irreplaceable loss of resources	*The development could lead to significant losses in unidentified and unmitigated site*
Duration	*The impact on heritage resources such as archaeological sites will be permanent*
Cumulative effect	*As the type of development impact on a large area, and other similar development in the area will also impact on archaeological sites the cumulative impact is seen as having a medium negative impact.*
Intensity/magnitude	*The large scale impact on archaeological sites and will require mitigation work.*
Significance Rating	*The overall significance rating for the impact on heritage resources is seen as high pre-mitigation. This can be attributed to the very definite possibility of encountering more archaeological sites as shown through fieldwork. The implementation of the recommended heritage mitigation measures will address the envisaged*

	impacts and reduce the overall rating to a low impact rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating	-51 (high negative)	-24 (low negative)
Mitigation measures	• *Monitoring during construction by and archaeologist* • *Mitigation through archaeological excavations and collection* • *Walkdown of final power line route*	

Table 6: Rating of impacts – Palaeontological resources

IMPACT TABLE	
Environmental Parameter	*Heritage Resources – Palaeontological resources*
Issue/Impact/Environmental Effect/Nature	*The possibility of encountering previously unidentified fossils.*
Extent	*Will impact on the footprint area of the development*
Probability	*The fieldwork has shown that such a predicted impact will most probably not occur*
Reversibility	*Due to the nature of fossils the impact is seen as irreversible, however mitigation could enable the collection of enough information to preserve the data from such a site*
Irreplaceable loss of resources	*The development could lead to losses in unidentified and unmitigated fossils*
Duration	*The impact on heritage resources such as palaeontological sites will be permanent*
Cumulative effect	*As the type of development impact on a large area, and other similar development in the area will also impact on palaeontological sites the*

	cumulative impact is seen as having a low negative impact.	
Intensity/magnitude	*The large scale impact on palaeontological sites and may require mitigation work.*	
Significance Rating	*The overall significance rating for the impact on palaeontological resources is seen as medium pre-mitigation. This can be attributed to the very low possibility of encountering more fossil sites as shown through fieldwork. The implementation of the recommended heritage mitigation measures will address the envisaged impacts and reduce the overall rating to a low impact rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	1	1
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-12 (high negative)	-11 (low negative)
Mitigation measures	*None required*	

4.4 Cumulative Assessment

A large number of solar projects are proposed and some have been approved and is currently in construction around the study area. Section 4 identified finds and conclusions made by other HIA's from other project that has shown the vast distribution of Stone Age sites over the larger area around Copperton. Although some studies have proposed mitigation work only one report on mitigation work (Orton, 2014) for the Mulilo Prieska PV (Pty) Ltd development just south of the Coppertpm, has been completed at this stage.

The need for the implementation of the recommended mitigation measures is of great importance and must be seen in the context of the large areas to be impacted by the construction activity. By implementing the mitigation measures the cumulative effect will be reduce from a Medium to a Low negative impact rating.

4.5 Projected Impact Summary

Table 7 provides a summary of the projected impact rating for this project on heritage resources.

Table 7: Comparison of summarised impacts on environmental parameters

Environmental parameter	**Issues**	**Rating prior to mitigation**	**Average**	**Rating post mitigation**	**Average**
Heritage resources	Impact during construction	51		24	
			High Negative Impact		Low Negative Impact

5 CONCLUSIONS AND RECOMMENDATIONS

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant.

The Heritage Scoping Report has shown that the proposed Aletta WEF projects may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites.

Evaluation of aerial photography has indicated the following area that may be sensitive from an archaeological perspective (**Figure 7**). The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 4**.

The heritage sensitivity does not indicate no-go areas in the maps, but rather the possibility of encountering heritage sites that will require further mitigation before construction commence.

Table 8: Landform to heritage matrix

LAND FROM TYPE	**HERITAGE TYPE**
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Dunes	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

These findings provide the basis for the recommendation of further field truthing through an archaeological walk down and palaeontological desktop study covering the site. The aim of this will be to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan as derived from the EIA.

5.1 Projected Impact Summary

Table 9 provides a summary of the projected impact rating for this project on heritage resources as derived from Section 4.2-4 of this report.

Table 9: Comparison of summarised impacts on environmental parameters

Environmental parameter	Issues	Rating prior to mitigation	Average	Rating post mitigation	Average
Heritage resources	Impact during construction	51		24	
			High Negative Impact		Low Negative Impact

6 REFERENCES

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KAPLAN, J.M. & WILTSHIRE, N. 2011. Archaeological Impact Assessment of a proposed wind energy facility, power line and landing strip in Copperton, Siyathemba municipality, Northern Cape. Agency for Cultural Resource Management

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FOURIE, W. 2015. Heritage Impact Assessment for the proposed Helena 3 PV project, Copperton Northern Cape.

VAN RYNEVELD, K. 2006. Phase 1 Archaeological Impact Assessment - Vogelstruisbult 104, Prieska District, Northern Cape, South Africa. National Museum Bloemfontein

Appendix A

LEGISLATIVE PRINCIPLES

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

3.1 General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the new legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources are integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle will be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the developer's cost. Thus, developers will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection, to all historic and pre-historic cultural remains, including graves and human remains.

3.2 Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Appendix C

Heritage Assessment Methodology

The section below outlines the assessment methodologies utilised in the study.

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Aletta WEF projects will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consists of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

- Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by qualified archaeologists, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

- Step III – The final step involved the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites was based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 10: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

Appendix C

Impact Assessment Methodology to be utilised during EIA phase

Methodology for Impact Assessment

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics, which include context, and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 11: Description

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.

IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).

CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect, which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY/ MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic, which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The 2010 regulations also specify that alternatives must be compared in terms of impact assessment.

Appendix 6I

Socio-Economic Assessment

ENVIRONMENTAL IMPACT ASSESSMENT FOR ALETTA WIND FACILTY

SOCIO-ECONOMIC IMPACT STUDY

SCOPING PHASE INPUT

JANUARY 2016

URBAN-ECON
Development Economists

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TABLE OF CONTENTS

1 INTRODUCTION

This document is prepared by **Urban-Econ Development Economists** in request by **SiVEST Environmental Division** on behalf of **BioTherm Energy (Pty) Ltd** to undertake a Socio-Economic Impact Study for the **proposed construction of the proposed 140MW Aletta wind facility** near Copperton. The socio-economic impact study is conducted as part of the Environmental Impact Assessment (EIA) process managed by SiVEST Environmental Division. This document forms part of the deliverable for the scoping phase of the process and undertakes to determine the current socio-economic baseline characteristics of the preliminary delineated study area, and identify the potential influence of the proposed project on the surrounding economic activities and communities to guide the assessment during the next phase.

1.1 Scope of the Study

The purpose of the socio-economic impact assessment is to determine the potential socio-economic implications of the project activities and associated infrastructure, and to compare its effects with the "no-go" alternative. The "no-go" alternative assumes that the proposed construction of the Aletta wind facility is not established, which means that it represents the current status of the environment, including the socio-economic situation.

The current report is prepared as part of the socio-economic study and is used as an input into the scoping report that is compiled by SiVEST Environmental Division. The scoping phase inputs address only a portion of the scope of work involved in the Socio-Economic Impact Assessment Study and enable the project team and the client to make more informed decisions regarding the way forward for the proposed project, from an environmental management point of view. The purpose of the socio-economic scoping report is as follows:

- Undertake a policy review and assess the alignment of the proposed project with the national, provincial and local socio-economic policies
- Create a socio-economic profile for the study area using secondary data
- Identify potential negative and positive economic impacts that could be generated by the proposed alternatives during the project life cycle
- Identify impacts and project effects (direct, indirect, induced, and cumulative) that will require further investigation and recommend an approach for pursual during the EIA phase for completion of the impact assessment exercise
- Identify gaps in knowledge and data that will need to be addressed during the EIA phase

1.2 Project Content, Location and Study Area Delineation

The proposed project involves the construction of the 140MW Aletta wind facility near Copperton. The study area is located in the Pixley ka Seme District Municipality within the Siyathemba Local Municipality, 6km north-east of Copperton.

The project will consist of one 140MW export capacity wind facility referred to as Aletta. The proposed wind facility is to be located on Portion 1,2,3 and the remainder of the farm Drielingspan No. 101 situated in the Siyathemba LM (refer to Figure 1.1).

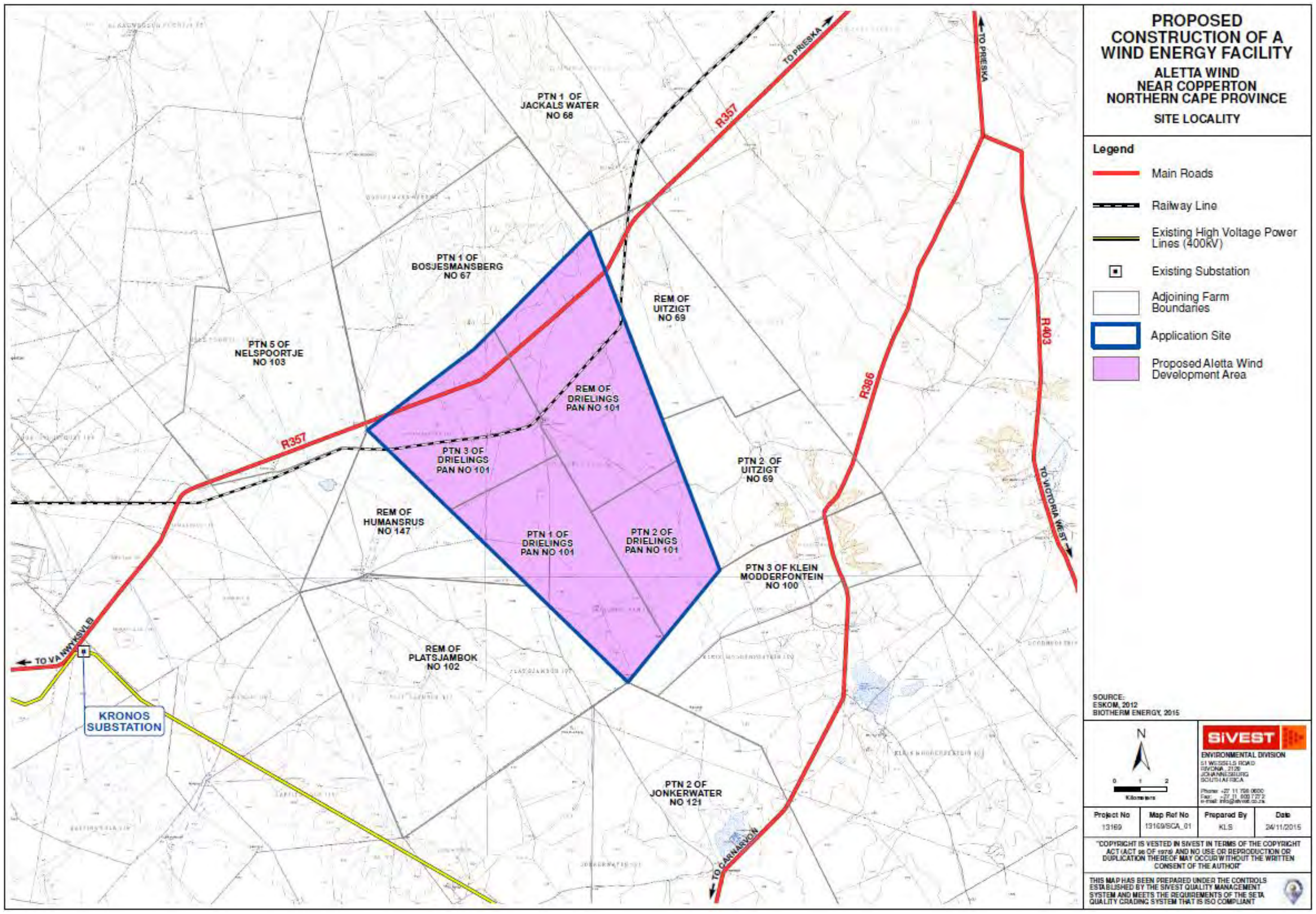

Figure 1-1: Project site

1.3 Methodology for the Scoping Phase

The methodological approach adopted for conducting the scoping study includes three phases:

- **Data collection:** Secondary research encompassing the examination of relevant policies, local and provincial strategic documents, and secondary data presented by Stats SA and Quantec. The information obtained assists in providing a preliminary profile of the socio-economic environment that could potentially be affected. Limited primary research is also undertaken, in case where owners or managers of farms where various components of the proposed project will be located were contacted to enquire about land-uses and concerns related to the project.

- **Baseline profiling:** A description of the study area is given in terms of selected socio-economic variables. It includes the analysis of spatial context and regional linkages, population size and household numbers, structure and growth of the economy, labour force and the employment situation as well as access to basic services and the state of the local built environment. Profiling for the study is done making use of the Quantec Research database, Stats SA's Census 2011 data, and various strategic documents produced for the relevant municipality. A brief profile of the directly affected zone of influence is also provided.

- **Identification of the anticipated impacts:** This step includes the identification of the socio-economic impacts that could be expected during various phases of the project's life cycle and the way forward with respect to the collection of data required to quantify and qualify the impacts.

All impacts identified were rated according to the evaluation methodology prescribed by the environmental consultant. The following table outlines various ratings used to determine different levels of severity, spatial scale, duration, and probability during evaluation.

Table 1-1: Criteria options and associated rating

NATURE		
This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
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PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
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DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the duration of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
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Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Table 1-2: Impact significance thresholds

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
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74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

2 POLICY REVIEW

A policy review plays an integral role in the early stages of a project. The review provides an indication of whether a project is aligned with the goals and aspirations of the developmental vision in South Africa and at local level. Furthermore, the analysis signposts any red-flag or developmental concerns that could jeopardise the development of the project and assist in amending it, preventing costly and unnecessary delays.

The following government strategic documents applicable to the delineated study areas were examined:

- National (South Africa):
  - New Growth Path Framework (NGPF) (2010)
  - National Development Plan (NDP) 2030 (2011 – 2030)
  - Integrated Resource Plan (IRP) 2010-2030 promulgated in 2011
  - Industrial Policy Action Plan (IPAP2) (2014/2015 – 2016/2017)

- Regional (Northern Cape province):
  - Northern Cape Provincial Spatial Development Framework (NC PSDF) (2012)
  - Northern Cape Provincial Growth and Development Strategy (NC PGDS) (2008)
  - Northern Cape Local Economic Development Strategy (NC LEDS) (2011)

- Local (Pixley ka Seme district Municipality and Siyathemba LM):
  - Pixley Ka Seme District Municipality Integrated Development Plan (Pixley Ka Seme IDP) (2014/2015-2016/2017)
  - Pixley Ka Seme DM Growth and Development Strategy (Pixley Ka Seme GDS) (2006-2016)
  - Pixley Ka Seme DM Spatial Development Framework (Pixley Ka Seme SDF) (2013-2018)
  - Siyathemba Local Municipality Integrated Development Plan (Siyathemba IDP) (2014/2015)
  - Siyathemba Local Municipality Local Economic Development (Siyathemba LED) Strategy (2012)

National policy alignment

South Africa suffers from a high level of poverty and inequality, which influence developmental objectives set by government. Greater inclusivity, faster growth (i.e. 5.4% by 2030), servicing the needs of all South Africans, equipping people with skills, and achieving close to full employment (i.e. 11 million new jobs by 2030) are among the key priorities for the country for the next fifteen years (National Planning Commission, 2011).

Investment in infrastructure, including expansion of electricity generation capacities, is acknowledged to be an important prerequisite for achieving the targeted economic growth rates and employment creation (National Planning Comission , 2011). Considering that the NDP 2030 also calls for a more sustainable use of natural resources and transition to a low-carbon economy, it is clear that reliance on carbon fuels to generate electricity is not a desirable future. Therefore, development of new electricity generation capacities is planned through diversification of the current electricity generation mix, which involves among others harnessing of renewable energy sources.

Through the Integrated Resource Plan (IRP) 2010 – 2030 (Department of Energy , 2011), government has committed to produce 8 400 MW from Photovoltaic (PV), 8 400 MW from Wind and 1 000 MW from Concentrated Solar Power (CSP) by 2030. In order to achieve this, the Renewable Energy Independent Power Producer Procurement Programme (RE IPPPP) was launched. To this date, three ministerial determinations have been made that called for the procurement of 13 125 MW (out of envisaged 17 800

MW) of renewable energy from IPPs, of which 6 360 MW were allocated for wind energy projects. Considering the four bidding windows that have been completed so far, 2 660 MW have already been awarded to wind energy projects. This means that 3 700 MW are still available for allocation in the future bidding rounds, creating opportunities for establishment of new wind energy projects similar to the one under analysis.

All of the above suggests that **the proposed project is in alignment with the national developmental priorities and programmes aimed at increasing domestic electricity generational capacity**. Furthermore, the proposed project, if approved, would allow sustaining “a competitive renewable energy manufacturing sector and related support industries” that would have been established in the country by that time on the backbone of the RE IPPPP. This means that the project also falls in line with the IPAP 2014/2015 – 2016/2017, which focuses on strengthening the capacity of solar and wind energy generation in the country and subsequently increasing the local content of renewable energy projects in South Africa.

Regional policy alignment

The Northern Cape Province faces numerous socio-economic and developmental challenges, which are not unique to the Province and are observed throughout the country. Reducing poverty through social development and achieving a sustainable economic growth in the Province through diversification and transformation of its economy are at the forefront of the provincial government’s developmental objectives (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).

The Northern Cape Province is endowed with biological diversity, mineral resources, and renewable energy sources such as solar and wind. Therefore, the achievement of its developmental objectives is envisaged to be done by capitalising on the local resources and specifically, the development of the agriculture and agro-processing, mineral extraction and mineral beneficiation, fishing and aquaculture, manufacturing, and tourism industries (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).

Ensuring availability of inexpensive energy is seen to be fundamental to growing competitive industries in the Province (Northern Cape Government, 2008). However, provincial government advocates the development of the energy sector in the Province through “the promotion of the adoption of energy applications that display a synergy with the province’s natural resource endowments” (Northern Cape Government, 2008). This implies the use of renewable energy sources and natural gas fields that the Province enjoys (Northern Cape Government, 2008). Provincial strategic documents specifically promote the development of large-scale renewable energy projects, similar to the one under analysis, which among others, would contribute to renewable energy targets set by national government and allow to secure supply, tackle climate change and address the needs of the Province (Office of the Premier of the Northern Cape, 2012).

Harnessing renewables is also seen to contribute towards alleviation and reduction of poverty in the Province. One of the interventions that underpins the provincial approach to poverty eradication is “utilisation of natural resources in a sustainable manner”, which in turn implies the transition to greater exploitation of renewables, including wind (Northern Cape Government, 2008).

Considering the above, it can be concluded that **the development of the proposed project follows the provincial priorities and developmental objectives**. From a spatial perspective, **the project also does not appear to raise any red flags**. As illustrated in Figure 2-1, the area where the project is proposed to be located is designated for agricultural land use. The review of the vision for the development of the agricultural sector in the Province further suggests that the area is suitable for forestry or grazing, where development of non-agricultural activities is not prohibited but should follow sustainable development principles.

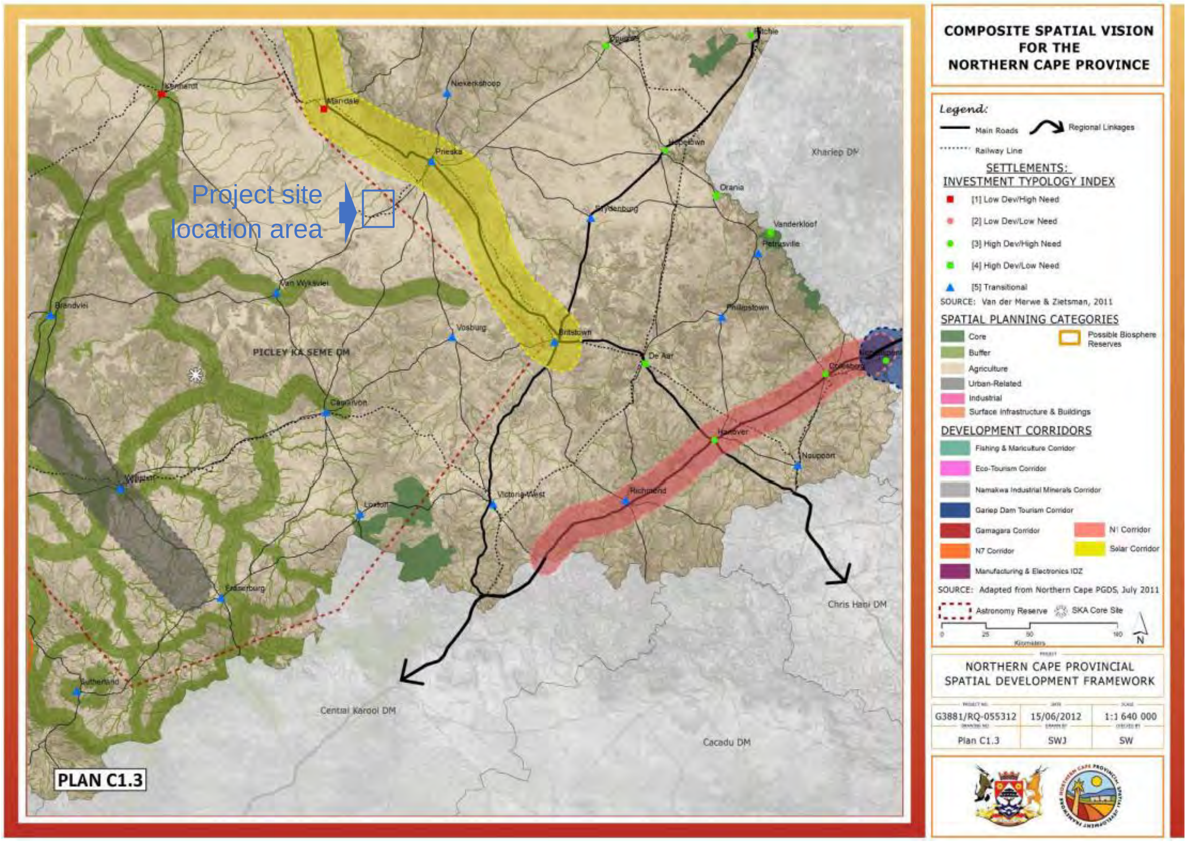


Figure 2-1: Spatial vision for the south-eastern part of the Northern Cape (Office of the Premier of the Northern Cape, 2012)

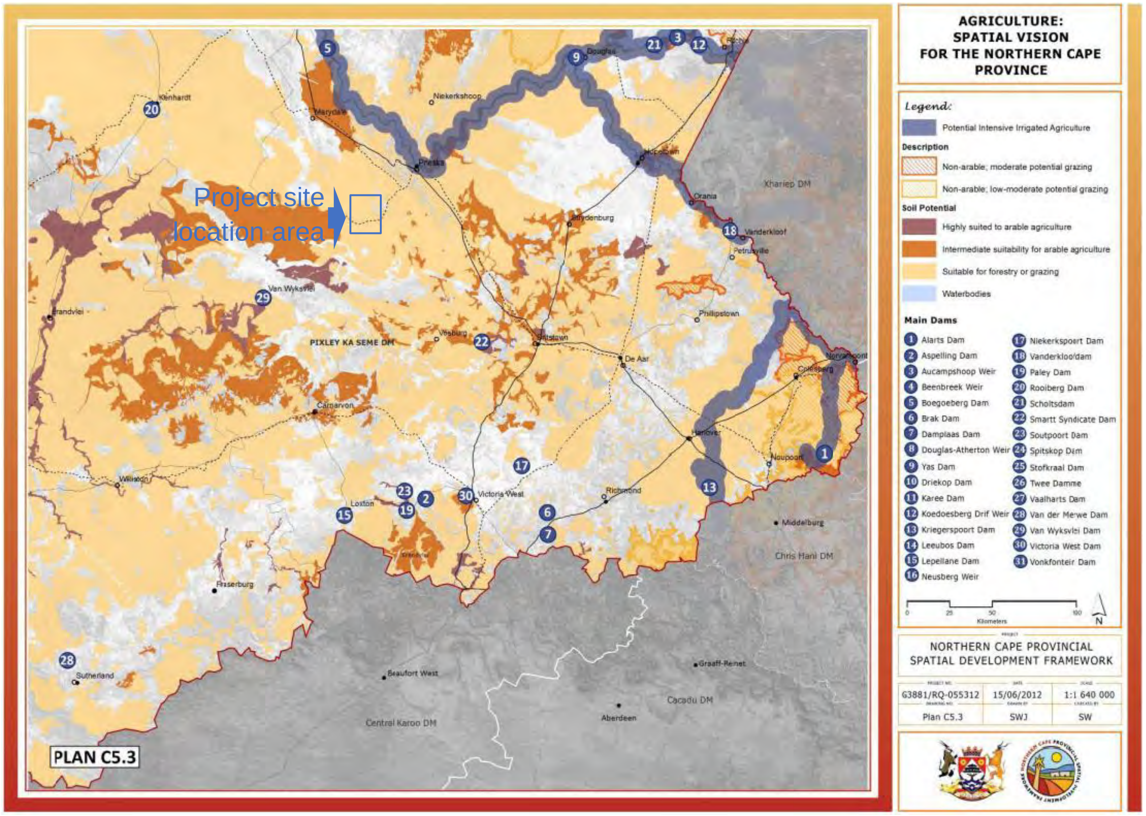


Figure 2-2: Spatial vision for agriculture for the south-eastern part of the Northern Cape (Office of the Premier of the Northern Cape, 2012)

Local policy alignment

Similar to the Province, the district and local municipalities where the proposed project is to be established, also face challenges of poverty, unemployment, and income inequality. Therefore, the municipalities' developmental priorities largely coincide:

- In order to optimise the resources directed at addressing these challenges, the Pixley ka Seme District set eight development priorities for the municipality (Pixley ka Seme District Municipality, 2014). These priorities are envisaged to be achieved through, among others, good service delivery, human and natural resource development, integrated rural and urban planning, employment creation and the development of a vibrant tourism industry (Pixley ka Seme DM, 2014, Pixley Ka Seme DM, 2013).
- The Siyathemba LM also prioritises an optimal distribution of resources, economic development through job creation and poverty reduction strategies, and effective and efficient service delivery to propel the development in the municipality (Siyathemba LM, 2014). Economic development is envisaged to be achieved through the support and growth of the priority sectors such as the agricultural, mining, manufacturing, tourism and retail sectors. Alternative energy sources have also been identified to be an anchor economic activity in the municipality that could propel local economic development through its linkages with other sectors.

It is clear that the proposed project is in line with the overall objectives of sustainable resource usage and economic development in the area.

When it comes to renewable energy development, both the Pixley ka Seme and Siyathemba municipalities' strategic documents largely focus on solar energy projects. The Siyathemba LM, and specifically the area outside Prieska, has already been designated for the establishment of a solar park (1 GW) and the municipality has already allocated communal land for this project (Siyathemba LM, 2014). The focus on solar energy projects is most probably attributed to the limited knowledge of the wind resource potential in the Northern Cape at the time of the formulation of the Provincial SDF, which informed local strategic documents and specifically the location of the renewable energy corridor area and its focus on solar energy projects.

Notably, limited reference to wind energy projects in the strategic documents of the local government do not in any way reduce the importance of wind energy project developments in the municipalities of Pixley ka Seme and Siyathemba. As mentioned earlier, such projects are seen in support of the government's objective to exploit renewable energy sources for the purpose of developing the local economies and assist the district municipality in entrenching its position as a renewable energy hub. This is also confirmed by the fact that a number of wind energy facilities have already been approved for the development in the area under the RE IPPPP.

From a spatial framework perspective, the local municipality does not have an approved SDF. Therefore, assessing whether the proposed project is in contradiction with the spatial vision for the area where it is proposed to be developed is not possible. It should be mentioned though, that agriculture and tourism are considered by local government to be important contributors to the future growth and development of the local economy as well as towards achieving sustainable use of resources. This means that a land use analysis will need to be undertaken to determine whether the proposed project would limit the growth potential for the above-mentioned two sectors.

After considering the reviewed documentation, the proposed wind facility is in alignment with national, provincial and local objectives, plans and strategies relating to socio-economic development of the areas under analysis. There were no fatal flaws or contraventions identified as all spheres of government prioritise the development of renewable energy projects. The proposed project fits well with the plans to diversify the provincial, district and local economies through investment in renewable energy projects. However, considering the importance of the agricultural and tourism industries in the development of local economies, an investigation into the current land uses in the zone of influence of the proposed project will need to be undertaken. This will be required to determine if the proposed project are to have any negative impact on the growth and development of these sectors.

3 BASELINE INFORMATION

This chapter examines key socio-economic characteristics of the study area, as per delineation provided in the previous chapter. This is essential as it provides both qualitative and quantitative data related to the communities and economies under observation, creating a baseline against, which the impacts can be assessed.

3.1 Study area's composition and locational factors

Spatial context and regional linkages

The **Northern Cape Province** is geographically the largest province in South Africa, covering an area of 372 889 km^2, which constitutes approximately 30% of the country's total area. Despite having the largest surface area, the Northern Cape Province is the least populated of all nine provinces. According to Census 2011, the Province's population was 1 145 859 or 2.2% of the national population. The Province is bordered by Namibia and Botswana in the north, while domestically, the North West Province borders it in the north-east, the Free State Province in the east, the Eastern Cape Province in the south-east, and the Western Cape Province to the south and south-west. The Northern Cape consists of five districts, namely Frances Baard, Pixley ka Seme, Namakwa, ZF Mgcawu (previously known as Siyanda) and John Taolo Gaetsewe.

The Pixley ka Seme DM, which lies in the south-east of the Northern Cape Province, is geographically the second largest of the five district municipalities in the Province and covers a surface area of 103 410 km². It is bordered by the Free State in the east, the ZF Mgcawu District in the north, the Eastern Cape Province to the south, and the Namakwa District in the west. The total population of the district, according to the 2011 Census, was approximately 186 349, making it the municipality with the second lowest population in the Northern Cape.

The Siyathemba LM is located within the central eastern parts of the Northern Cape Province and is traversed from the east to west by the Orange River, South Africa's largest river. The municipality covers a geographic area of 14 725 km^2. Prieska functions as the administrative seat of the local municipality. Other settlements include Marydale, Nierkerkshoop, and Copperton.

Spatially, Siyathemba is very distant from South Africa's largest consumer markets. The nearest major town to the site is Prieska, which has easy access to the main railway line running to Namibia and good tarred road connections to Upington, Kimberly, and De Aar.

Towns and Settlements

Copperton is the town located closest to the proposed project site. It was once populated area that housed nearly 3 000 miners and their families. As a result of the closure of the Copperton Mine, the population of the town dropped to 55 individuals (33 households) by 2011 (Stats SA, 2015). A few of the unoccupied houses are currently used by Denel SOC Ltd, which operates a missile testing center in the area (Wikipedia, 2014).

Figure 3-1: Settlements and towns near the project site (Siyathemba LM, 2014)

The closest major town to Copperton is **Prieska**, which is situated approximately 50 km away and is located on the south bank of the Orange River at the foot of the Doringberg. Prieska was originally named Prieskap, a Khoisan word meaning, "lace of the lost she-goat". Prieska is the administrative seat of the Siyathemba LM. It is located on the southern bank of the Orange River and is home to 14 248 people (Stats SA, 2015). While relatively isolated, Prieska has good access to the main railway line leading to Namibia, good tarred road connections to Upington, Kimberley and De Aar, and two landing strips for light aircrafts.

Marydale, situated 60km north-west of Copperton, is a rural service centre. **Nierkerkshoop**, another rural service centre, is located approximately 80km north-east of Copperton. Both of these settlements are largely underdeveloped and sparsely populated.

Locational factors and major tourism attractions

Copperton can be accessed through the R357 from Prieska, which is a tarred road, as well as various dirt roads that stem from a north-westerly direction near the project site itself. These dirt roads lead to Marydale, but are not suitable for large traffic volumes; most motorists choose the tarred roads leading from Marydale to Prieska and then to Copperton. There are also tarred roads that lead to the military testing facility known as Alkantpan. From the aforementioned, it can be seen that access to the proposed location is limited to very few quality tarred roads and may need to be addressed when considering any further developments in said area.

Generally, the area does not have any significant mineral deposits. To the south of Prieska, on the farm Doornfontein, a medium-sized mineral deposit of Phosphate can be found. Various small mineral deposits can be found near Niekerkshoop. These include Tiger's-eye and Crocidolite (i.e. asbestos). Small deposits of Alluvial Diamonds can be found in the Orange River. Other small mineral deposits within the municipal boundary include Salt, Gypsum, Iron and Uranium (Siyathemba LM, 2014).

The Orange River runs through the municipality and provides ideal conditions for irrigation farming and cultivation of grains and vegetables.

The following are the main tourism attractions in the region (Siyathemba LM, 2014):

- Die Bos Nature Reserve
- British Fort
- Green Valley Nuts
- The Oranjezicht and Keikamspoort Hiking Trails
- Khoisan Rock Art
- Memorial Garden
- Prieska Museum
- Ria Huysamen Aloe Garden Schumann Rock Collection
- Wonderdraai Island

3.2 Sense of place, history and cultural aspects

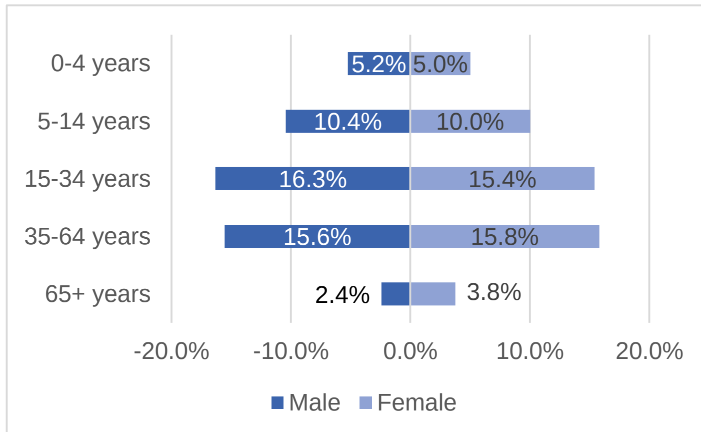
Copperton was once a populated town, providing accommodation for the mine workers and their families during the period from 1970 to the end of the 20th century. It was then sold to a private owner after the closure of the Copperton Mine and is currently on a long-term lease by the Request Trust. Some of the houses were initially demolished, but after the lease agreement was signed with the Request Trust, an agreement was reached that the rest of the houses could be retained and used for accommodation of occasional visitors that may visit the Alkantpan testing facility (Siyathemba LM, 2014).

The preferred language in the Copperton area is Afrikaans, followed by English. The immediate surroundings can be described as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.

Prieska is a far more densely populated area than Copperton, and has its origins in the early 1800's when farmers used it as a place to stay when the nearby dry riverbeds were full. It was administered by a village management board from 1882 and attained municipal status in 1892 (Siyathemba LM, 2016).

The preferred language in the Prieska area is Afrikaans (Stats SA, 2015). The sense of place is again defined as a semi-desert, natural region but more densely populated with small levels of visual and noise pollution. Prieska also has rich heritage and memorial sites that include the Khoisan rock art, the British Fort and the Boss Nature Reserve that are all near the town.

Marydale was established by the Dutch Reformed Church in 1903, and named after the wife of Mr. GP Snyman who owned the farm on which the town was built (Siyathemba LM, 2016). The preferred language in the area is Afrikaans with 96% of the population stating that it is their first language (Stats SA, 2015). The sense of place of the Marydale area and its immediate surroundings can again be defined as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.



Niekerkshoop was laid out on the farm Modderfontein in 1902 as an Asbestos mining centre. The village management board has administered it since 1904 (Siyathemba LM, 2016). The preferred language in the area is Afrikaans, with 95.8% of the population stating that it is their first language (Stats SA, 2015). The sense of place of the Niekerkshoop area and its immediate surroundings can again be defined as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.

3.3 Demographic Profile

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills, and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

Population demographics

The Siyathemba LM is home to approximately 21 593 people, with a total of 5 830 households (Stats SA). The population has increased by 14.9% from 18 376 in 2001. A large portion (87.2%) of the population in the LM resides in urban areas, while the rest (12.8%) lives on farms. Both urban to urban migration and rural to urban migration are relevant in the Pixley ka Seme region, including the Siyathemba LM. Rural to urban migration is perceived as the dominant migration type at present (Pixley ka Seme District Municipality, 2014/15). The large proportion of people living in the urban area can be explained by the ease of access to opportunities and services within the larger urban centres, in this case Prieska. The majority (72.2%) of the people in the municipality are Coloured with 18.5% of the population being Black, followed by White 8.4%), and Indians/Asians (0.5%). Afrikaans is the language most spoken in the LM. The municipality's sex ratios are not very skewed, the female population (50.1%) accounts for slightly more of the LM's population compared to the male population (49.9%).

The youth (age 15-34) make up the majority of the people living in the Siyathemba LM with 31.7%, followed by the group between the ages of 35

Figure 3-2: Age and gender profile

and 64 with 31.4%. Considering the working age group that is between the ages of 15 and 64, the municipality has a slightly bigger percentage of working age males than females (refer to Figure 3-2). The population in the area is characterised by a high dependency ratio (58.5%) with a total of 36.8% of the population within the ages of 0 to 14 (30.6%) and over 65 years old (6.2%). According to the district municipality's IDP, the implications of this population structure are a higher demand on the provision of social and physical facilities, like schools, primary health care centres, etc.

Health demographics

The effect that the HIV virus has had on the DM and LM is less profound than in the rest of South Africa and the Northern Cape Province but the number of HIV cases and AIDS related deaths have increased more rapidly in the last 15 years when compared to national and provincial averages.

Table 3-1: Population, HIV positive, AIDS and other deaths (2015)

Indicator	South Africa	Northern Cape	Pixley ka Seme DM	Siyathemba LM
Population	54 956 509	1 175 780	192 549	22 448
HIV positive	6 248 908	86 146	11 517	1 204
AIDS deaths	206 761	2 360	227	26
Other deaths	444 866	9 729	1 581	186

(Quantec, 2016)

The Siyathemba LM had a reported 1 204 individuals that were HIV positive in 2015, which equates to 5.3% of the total LM population. The percentage is far less than the National and Provincial levels at 11.3% and 7.3% for both provincial and national population, respectively. Total AIDS-related deaths equated to 26 individuals in the LM, or 0.1% of the LM population, which is again below the National and Provincial averages of 0.3% and 0.2% respectively. The AIDS-related LM deaths also equate to 12.2% of total deaths in the LM, which is lower than the national and provincial figures of 31.7% and 19.5%, respectively.

Since the year 2000, the number of people living with the illness has increased from 350 individuals in 2000 to just over 1 200 people in 2015. This indicates a near 250% increase in ten years, which is far more when compared to national and provincial averages (Siyathemba LM, 2014).

Crime demographics

Table 3-2: Crimes reported by crime type (2015)

Crime types	South Africa	Northern Cape	Pixley ka Seme DM	Siyathemba LM
Serious crimes	2 209 068	57 817	9 720	1 146
✓ **Community reported crimes**	2 068 261	54 724	8 952	1 052
✓ **Crimes dependent on police action for detection**	140 807	3 093	768	94

(Quantec, 2016)

The Siyathemba LM recorded 1 146 cases of serious crimes in 2015 of which 1 052 were reported by the community and 94 identified by police. Assault with the intent to inflict grievous bodily harm was the most common reported crime with 253 cases, followed by common assault with 112 cases and finally burglary at residential premises with 54 cases reported. Furthermore, 53 cases of stock theft were recorded in the LM, which can be attributed to the large number of stock farming occurring in the area. Drug-related cases were less prevalent in the LM, with only 4% of reported cases being drug related. This figure is 5% less than the District figure and 3% less than the provincial figure.

3.4 Economy

Size and contribution of local economy

In 2013, the Siyathemba LM economy was valued at R 796 million in current prices. The LM contributed 10.9% to the economy of the Pixley ka Seme District and made a contribution of 1.2% to the province's economy.

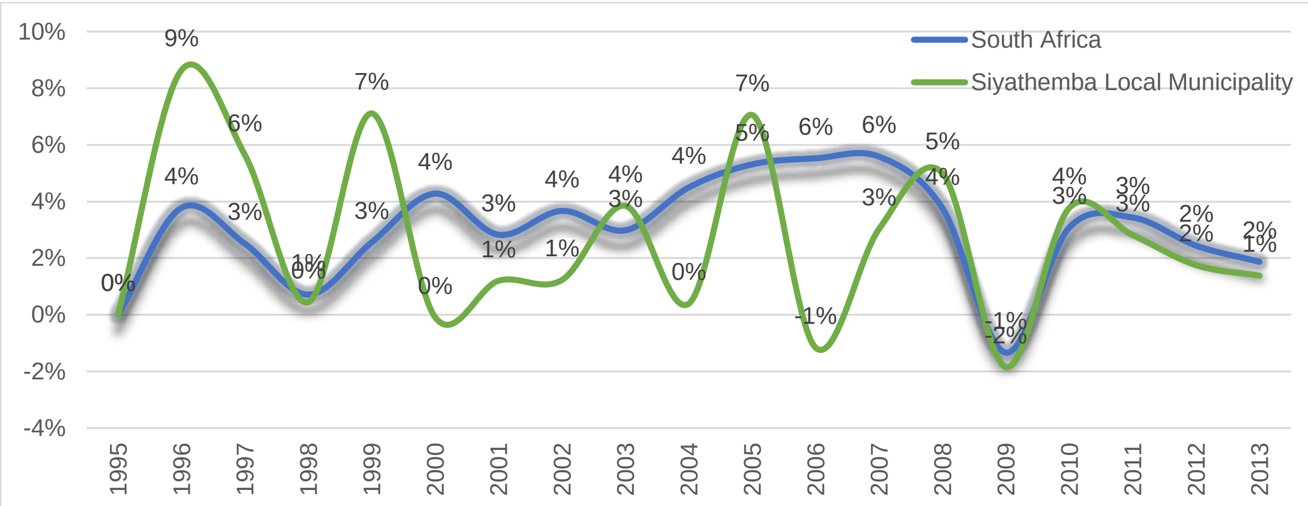


Figure 3-3: Growth rates for SA and Siyathemba LM (1995 – 2013) (Quantec, 2016)

High dependence of the LM on mining activities in the late 1990's and early 2000's, whilst targeting international commodity markets resulted in the local economy being highly susceptible to economic dynamics globally. **Error! Reference source not found.**3 illustrates that the Siyathemba economy is significantly more volatile than that of South Africa. This is largely due to the dependency of the local economy on the global demand for commodities as well as the stability of the industry internally (i.e. from a labour issue perspective).

The mining sector historically played a major role in the local economy, with asbestos and copper mining the key activities. Currently, mining activities are mainly related to alluvial diamond mining activities along the Orange River. The closure of the asbestos mines as well as the Copperton mine has had a major lasting negative impact on the Siyathemba LM economy, reducing the size of the mining industry from R47 million in 2003 to R9 million in 2013.

In 2009, as a result of the financial crisis globally, the economy contracted by 2%, but was able to recover somewhat in the following year. Sectors most heavily affected but the crisis include the wholesale and retail trade as well as the mining sectors.

Structure of the economy and dynamics

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector is also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

Table 3-1: The Northern Cape and Siyathemba LM structure of economies (2013)

Economic Sector	Northern Cape (GDP in 2013 prices)	Siyathemba LM (GDP in 2013 prices)

	GDP (R'ml)	% of GDP	CAGR (2004 - 2013)	GDP (R'ml)	% of GDP	CAGR (2004 - 2013)
Agriculture	3 674	5,4%	2,5%	132	16.7%	6.3%
Mining and quarrying	21 399	31,2%	-1,2%	25	3.1%	-15.3%
Manufacturing	1 676	2,4%	3,7%	29	3.6%	8.0%
Electricity, gas and water	1 708	2,5%	1,0%	18	2.3%	-2.8%
Construction	1 183	1,7%	5,9%	34	4.3%	6.7%
Trade	8 600	12,5%	2,7%	119	14.9%	-0.7%
Transport and communication	5 393	7,9%	3,0%	27	3.4%	-1.8%
Finance and business services	8 406	12,2%	4,4%	178	22.4%	5.2%
Personal services	6 195	9,0%	3,3%	113	14.2%	3.7%
General government	1 0423	15,2%	3,4%	63	15%	2.8%
TOTAL	**68 656**	**100,0%**	**2,1%**	**119**	**100,0%**	**12%**

(Quantec, 2016)

In terms of economic activities, the economy of the Northern Cape Province depends heavily on the primary sectors of the economy (agriculture and mining), which made up 31.2% of GDP-R in 2013. The largest sector is mining, which has been fluctuating between periods of growth and decline in contribution to the GDP-R. Agriculture, on the other hand, has declined in contribution from 8.7% in 2002 to 5.4% in 2013. Over a period of ten years (2003-2013), the LM's economy grew at a Compounded Average Growth Rate (CAGR) of 2.4% per year. This was slightly higher than the district and provincial average growth rates of 1.8% and 2.3%, respectively.

Contrary to the province's economy, mining and quarrying continues to be a small contributor to the economy of the LM, making a meagre 3.1% contribution compared to the province's 31.2%. This is a result of the decline in the mining industry mentioned above, and is further illustrated by a negative CAGR of 15% in the last ten years (see Table 3-3). On the other hand, the agricultural sector makes a significant contribution of 16.7%; making it the second largest single contributor after finance and business services (22.4%).

The agricultural sector has also shown steady growth in the last ten years with a CAGR of 6.3%, while finance and business services showed a 5.2% CAGR for the same period. The most extensively cultivated crops in the municipality are maize, wheat, peanuts, lucerne and table grapes. Stock farming activities are mainly based on sheep and goats. Another sector that has shown noteworthy growth is manufacturing with a CAGR of 8% over the last ten years, which is the highest of all the sectors. It also contributes 4.8% to the LM GDP. Overall, the economy of Siyathemba LM is a service economy with the tertiary sector contributing 70% to the municipality's GDP-R.

3.5 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

Labour force composition

The labour force consists of employed and unemployed persons. The Not Economically Active (NEA) portion of the population includes people that are not working as a result of choice, age or other circumstances. The unemployment rate indicates the percentage of unemployed individuals that form part of the labour force. It does not include discouraged job seekers, though this group of people will also be mentioned later in this section.

The Census 2011 data indicates that the Siyathemba LM had about 13 656 people in the working-age population. This amounts to 63% of the total population. Of these, 7 113 people were economically active, while roughly 48% of the working age population were not economically active (NEA); that is, persons aged 15–64 years who are neither employed nor unemployed at the time of the survey, including discouraged job seekers. The employed labour in the LM was estimated at 5 356, while the unemployed population was estimated at 1 757, reflecting an unemployment rate of 24.7%. This was lower than the country's unemployment rate of 29.7% and lower than the provincial unemployment rate that was recorded at 27.4%.

As indicated in Table 3-4, the town of Prieska had 3 094 of the working age population employed, with 1 212 of them unemployed. This means that 28.1% of the labour force in Prieska was unemployed. On the other hand, 4 672 of the working age population was not economically active. In the smaller towns, the unemployment situation was worse, with unemployment rates of 41% and 33.6% in Marydale and Nierkerkshoop, respectively (Stats SA, 2014). The Copperton community is very small and isolated from employment opportunities and amenities, but shows a 0% unemployment rate that can be attributed to the extremely small labour force and working age population in the area.

Table 3-4: Labour profile of the Siyathemba LM (2011)

Town/settlement	Working age	Labour force			Discouraged job seekers	Unemployment rate
		Employed	Unemployed	Total		
Copperton	40	16	-	16	7	0%
Marydale	1 507	297	207	504	100	41.1%
Niekerkshoop	1 115	472	239	711	12	33.6%
Prieska	8 978	3 094	1 212	4 306	578	28.1%
Siyathemba NU	1 972	1 463	81	1 544	77	5.2%
Westerberg	44	14	18	32	0	56.3%
TOTAL	**155 469**	**5 356**	**1 757**	**7 113**	**774**	**164.3%**

(Stats SA, 2015)

Employment structure

More than three quarters of the employed individuals in the Siyathemba LM were employed in the formal sector and only 10.8% were employed in the informal sector. Private households provided for 11.8% of the employment opportunities in the municipality.

In Prieska, 76.7% of the employment opportunities were provided by the formal sector, and only 10.8% came from the informal sector (see Figure 3-4). In Marydale, 71.4% of the employed population is employed in the formal sector, while only 66.2% of the Nierkerkshoop employment opportunities come from the formal sector. A significant percentage (18.9%) of Nierkerkshoop's employment opportunities come from the informal sector, while the same sector contributes only 15.3% towards employment in Marydale (Stats SA, 2015). In Copperton, 73.7% of the employment opportunities were provided by the formal sector with 12.4% coming from the informal sector and 11.5% being private households.

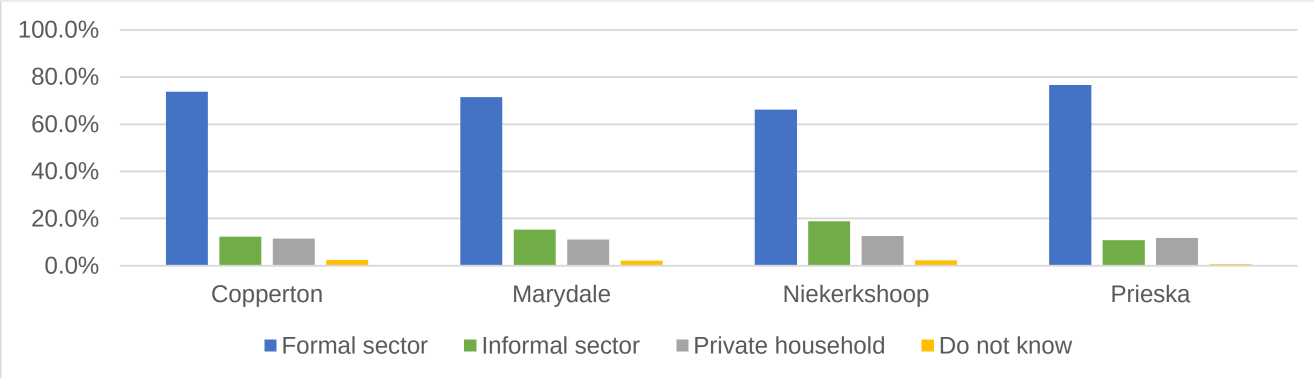


Figure 3-4: Regional employment by sector (Stats SA, 2015)

The tertiary sector is the largest contributor to formal and informal sector employment with 57.4% of opportunities offered by said sector. This is followed by the Primary sector with 28.3% and the secondary sector with 14.2%. The high tertiary sector figure is somewhat inflated by the community, social and personal services; and the general government industries that make up half of the tertiary sector. Considering the aforementioned, the main contributor to employment becomes the primary sector.

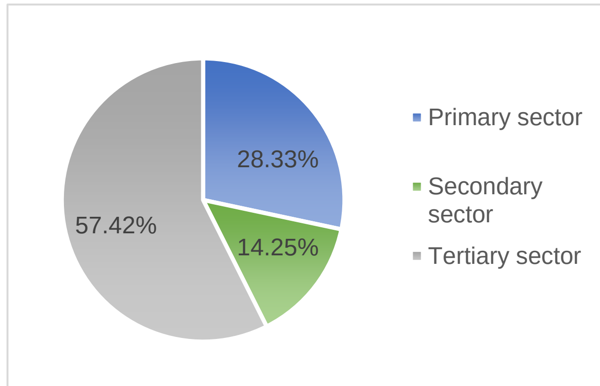


Figure 3-5: Siyathemba LM sectoral employment (Quantec, 2016).

In terms of the structure of employment, the agricultural sector was the most important economic sector not only in the LM but in the district as well. In the Siyathemba LM, this sector contributed 27.8% of the total employment opportunities, while creating 27.1% of employment opportunities in the Pixley ka Seme District. This was followed by personal services and general government. These figures are almost similar to those of the province but general government is the largest contributor to employment in the Northern Cape Province. Table 3--5 below indicates the contribution of economic sectors to employment in the district and the LM.

Table 3-5: Employment by economic sectors in Pixley ka Seme DM and Siyathemba LM

Economic Sector	Pixley ka Seme DM Employment		Siyathemba LM Employment	
	Employment	%	Employment	%
Agriculture	12 587	27.1%	1 637	27.8%
Mining and quarrying	342	0.7%	32	0.6%
Manufacturing	1 354	2.9%	219	3.7%
Electricity, gas and water	358	0.8%	24	0.4%
Construction	2 813	6.1%	596	10.1%
Trade	6 491	14.0%	774	13.1%
Transport and communication	839	1.8%	50	0.8%
Finance and business services	5 357	11.6%	751	12.8%
Personal services	8 489	18.3%	921	15.6%
General government	7 756	16.7%	888	15.1%
TOTAL	**46 387**	**100%**	**22 3232**	**100%**

(Quantec, 2016)

Formal sector employment for the LM consists of mainly semi- and unskilled workers with 82.9%, followed by skilled workers with 17.1%. This is in alignment with the district averages that show almost the same figures for each skill level (see Table 3-6).

Table 3-6: Employment by skill level and occupation in Pixley ka Seme and Siyathemba

Skills	Pixley ka Seme DM Employment		Siyathemba LM Employment	
	Employment	%	Employment	%
Skilled	**7 950**	**18.2%**	**923**	**17.1%**
• Legislators, senior officers and managers	2 782	6.3%	338	6.3%
• Professionals	1 733	4%	241	4.5%
• Technicians and associate professionals	3 435	7.9%	344	6.4%
Semi-skilled	**19 734**	**45.1%**	**2 371**	**43.92%**
• Clerks	4 557	10.4%	395	7.3%
• Service workers and shop and market sales workers	6 103	14%	775	14.4%
• Skilled agricultural and fishery workers	2 459	5.6%	309	5.7%
• Craft and related trades workers	4 258	9.7%	498	9.2%
• Plant and machine operators and assemblers	2 354	5.4%	394	7.3%
Unskilled	**16 086**	**36.8%**	**2 105**	**39%**
• Elementary occupations	16 086	36.8%	2 105	39%
TOTAL	**43 770**	**100%**	**5 398**	**100%**

(Stats SA, 2015)**Error! Reference source not found.**Table 3-6 illustrates that elementary occupations represent the biggest single group of skills observed in the municipality, which is in line with the formal employment and economic profile of the area requiring labourers in the agriculture, mining and other industries. Services workers and shop sales workers, as well as craft and related trade workers represent the second and the third largest group of formal occupation in the area. This again fits the profile of the local economy, where the former are largely engaged in the trade and personal services sector, while the latter is involved in the agricultural and mining industries.

3.6 Income

The average monthly household income in the Siyathemba LM was R6 858 in 2014 prices. This was less than the national, provincial and district levels, which had average household incomes of R9 743, R8 116 and R7 030, respectively. Overall, approximately two thirds of the population in the Siyathemba LM earns up to R3 200 a month, this is larger than the same group at district and provincial level. According to the Pixley ka Seme IDP, the cut-off monthly household income for indigence in the Siyathemba LM is R1 500. This refers to those households who, due to a number of socio-economic factors, are unable to afford basic services such as water, basic sanitation, basic energy, health care, housing, food and clothing. From income data obtained in the 2011 Census, approximately 39.4% of the households would qualify as indigent in the local municipality.

Table 3-7: Household per monthly income groups (2011)

Indicator	Siyathemba LM	Towns/main places in the Siyathemba LM					
		Copperton	Marydale	Niekerkshoop	Prieska	Siyathemba NU	Westerberg
No income	7.1%	25%	9.1%	10.6%	8%	3.8%	0%
R1 – R3 200	62.9%	25%	49.5%	76.1%	55.56%	77%	100%
R3 201 – R6 400	10.9%	0%	18.5%	3.8%	14.6%	4.3%	0%
R6 401– R12 800	9.1%	25%	12.1%	3.3%	12.3%	3.7%	0%
R12 801– R25 600	5.9%	25%	4.7%	3.8%	6.4%	5.8%	0%

R25 601– R51 200	1.3%	0%	0%	0%	1.7%	1.5%	0%
>R51 200	0.3%	0%	0%	0.8%	0.2%	0.5%	0%

(Stats SA, 2015)

Table 3-7 shows the income spread for the various settlements/towns in the Siyathemba LM. Niekerkshoop is by far the poorest community of the delineated areas, with nearly 87% of its population earning less than R3 200 a month. This is followed by Prieska with 64% and Marydale 58.6% for the same income spread. Copperton shows that 50% of its population lives below the R3 200 income level, which is far less than other delineated areas. This can be attributed to the small population size that exists in Copperton.

In terms of education levels in the LM, 11.5% of the adult population (over 20 years of age) had no education at all, while 64% have primary or secondary education (Stats SA, 2015).Those with higher educational qualifications accounted for 5.5% of the population. These figures indicate an increase in all categories since 2001, except for the no schooling, some primary and some secondary categories. In general, there has been an improvement in the educational qualifications of the labour force in the local municipality. The no schooling category decreased by 10%, indicating a higher percentage of people attending school. While the share of people with no schooling at district level is 14.1%, the percentage of people with no schooling is notably lower at provincial (11.1%) and LM (11.5%) level. Additionally, the number of people who have completed matric in Siyathemba is 17.3%, which is lower than the 20% and 22.1% at district and provincial levels, respectively.

The relatively low level of education in the LM is supported by the economic profile that exists in the region. The dependence of household income on the Agricultural, and Wholesale and retail trade sectors would act as a disincentive for further higher education studies, as sectors that support such employment are not well developed in the area.

4 ACCESS TO SERVICES AND STATE OF LOCAL BUILT ENVIRONMENT

Access to shelter, water, electricity, sanitation, and other services are indicators that assist to determine the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure is another indicator to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities further indicates the nature of the study area, which is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against, which the potential impacts of the proposed project can be assessed.

4.1 Settlement profile

The Siyathemba LM is characterised by a low population density when compared to the national level (about 42 people/km^2). However, the municipal population density is half that of the Province but nearly the same as the district.

Table 4-1: Population density of Siyathemba LM (2011)

Indicator	Siyathemba LM	Towns/main places in the Siyathemba LM					
		Copperton	Marydale	Niekerkshoop	Prieska	Siyathemba NU	Westerberg
Population total	21 593	55	2 622	1 829	14 248	2 765	74
Area (Sqr Km)	14 725	71	63	31	196	14 355	9
Population density	1.5	0.8	41.4	59	72.9	0.2	8

(Stats SA, 2015)

Population densities for the entire LM are extremely low, showing 1.5 individuals for every square kilometre. When focusing on the towns, it can be seen that Copperton is one of the most sparsely populated towns in the entire LM, showing 0.8 individuals for each square kilometre. Prieska is by far the most densely populated town in the LM, showing nearly 73 individuals for every square kilometre. This fact, coupled with its high population, indicates that it is the commercial hub for the LM. The large agriculture sector that exists in the LM supports the low population densities in the settlements, as large portions of land are used for sheep farming.

4.2 Access to Housing and Basic Services

Housing

Approximately 85% of the households in the Siyathemba LM reside in formal housing in the form of a house or other brick structures on a separate stand or yard. 14.3% of the households live in informal dwellings. Furthermore, 0.7% of the municipality's households live in traditional dwellings. These numbers are similar to those of Prieska, with about 85.3% households living in formal dwellings, while 14.5% live in informal structures.

The allocation of funds for Siyathemba Municipality is relatively small. The Municipality is therefore, struggling to address the housing need in the area. With the Housing Allocation to date, the LM managed to build 223 new RDP housing units in Prieska. New applications have been submitted to COGHSTA for 310 RDP units in Prieska, 55 in Marydale, and 54 in Niekerkshoop (Siyathemba LM, 2014).

Access to water

In terms of access to piped water, 88.7% of the households in the municipality have access to piped water either inside the dwelling or in the yard. The picture improves in Prieska, where 94.9% of the households have access to piped water inside their dwellings or yard. Only 1.2% of the households in the town do not have access to piped water at all. In terms of the supply, the bulk of the water in the LM is supplied by the municipality or other service providers. In Prieska, close to 97% of the households' water is supplied by the municipality or other water service providers, while in the non-urban areas of the municipality only 1.1% of water is supplied by bulk water infrastructure connections. Two thirds of the households in non-urban areas used boreholes (Stats SA, 2014). The district's IDP notes that water provision and availability is one of the issues that will have to be addressed in order to improve the economic activity in most towns situated within the Pixley ka Seme District Municipal area (Pixley ka Seme District Municipality, 2014/15).

Bulk water supply for Prieska is sustainable while bulk water supply for Marydale and Niekerkshoop os expected to become a problem within the next 15- 18 years. Therefore, new bulk water supply studies have been commissioned for Niekerkshoop, which is expected to experience water shortages first (Siyathemba LM, 2014).

Access to sanitation

If not properly managed and monitored, sewerage and sanitation are basic needs of communities that can pose serious health and hygiene risks. 71.2% of the households in the Siyathemba LM had access to a flushing toilet, while 16.8% of the households used pit latrines. 7.7% of families have no access to toilet facilities and 3.8% is still using the bucket system. According to the Siyathemba LM IDP, the municipality has a sanitation backlog of 470 households.

During the 2011/12 financial year, the Municipality received funds from DWA through the Accelerated Community Infrastructure Programme (ACIP). This grant was utilised to refurbish sanitation infrastructure and equipment. The following projects were set in motion but no information was available on which had been completed:

- Prieska:
    - Purchase of two standby sewer pumps
    - Refurbishment of sewer tank intake
    - Replacement of manhole covers at main sewer pump sets
- Marydale:
    - Refurbishment of sewer tank intake
    - Refurbishment/ replacement of night soil suction tanker
    - Fence oxidation pond area
- Niekerkshoop:
    - Refurbishment of sewer tank intake into oxidation ponds
    - Refurbishment/ replacement of sewer tanker

Access to electricity

The indicator “energy for lighting” was used as a proxy for measuring households’ access to electricity. The majority of households (86.3%) in the municipality have access to electricity, while 13.7% use alternative forms of energy for lighting; mainly candles (11%).

The Municipality has developed an Electricity Master Plan in the early 2000s. The Municipality works according to this plan to upgrade electricity infrastructure, as well as to develop new infrastructure (Siyathemba LM, 2014).

4.3 Transport infrastructure

Spatially, Siyathemba is very distant from South Africa’s largest consumer markets. It is located some 182km from De Aar (administrative seat of the Pixley ka Seme DM) and 236km from Kimberley. The area is traversed by the R357, which links the site to Prieska. Prieska has easy access to the main railway line to Namibia, and good tarred road connections to Upington, Kimberly and De Aar.

Copperton can be accessed through the R357 from Prieska, which is a tarred road, as well as various unnamed dirt roads that stem from a North Westerly direction near Eureka itself. These dirt roads lead to Marydale but are not adequate for large traffic volumes and many vehicle drivers choose the tarred roads from Marydale to Prieska and then to Copperton. There are also tarred roads that lead to the Alkantpan military testing facility. From the aforementioned it can be seen that access to the proposed location is limited to very few quality tarred road and may need to be improved when considering any further developments in said area.

The rural nature of the area impacts on the modes of transport relied on by local population for travelling from and to work. The Northern Cape Province has the largest percentage of people compared to other Provinces who “walk” to and from work (Department of Transport, 2013). Those who rely on some mode of transportation for travelling to and from work mainly make use of private transport. Public transport is the mode of choice among a relatively small percentage of people living in the Province. All of the above suggests that the local area is likely to have limited access to public transport due to relatively low population densities.

4.4 Social and Recreational Infrastructure

The Siyathemba LM has the following social and recreational infrastructure available:

- Where education facilities are concerned, the municipality has one crèche, 6 primary schools and 3 combined schools and one secondary school.
- The municipality has five community halls.
- There are four libraries in the municipality.
- Recreational facilities are available in each of the three towns
- There is a police station in each of the three towns (Marydale, Prieska and Nierkerkshoop)
- There are five health facilities in the municipality, i.e. one hospital, three clinics and a mobile clinic. It is indicated that the main challenge is the lack of ambulance services in Nierkerkshoop (Siyathemba Local Municipality, 2014).

5 SITE-RELATED INFORMATION

The site related information section will investigate the various dynamics of the proposed site to ensure that the current land use activity does not conflict with the establishment of the proposed facility. If there are any conflicts identified, then they will be investigated further in the next phase.

5.1 Land-use profile

Figure 5-1 illustrates the proposed site (purple region) for the Aletta wind facility near Copperton. The proposed site will directly affect four farm portions of land namely: portion 1, 2, 3 and the remainder of Drielingspan No. 101. The proposed site lies on the urban edge of Copperton, approximately 7km away from the city centre and is easily accessed by the R357 main road.

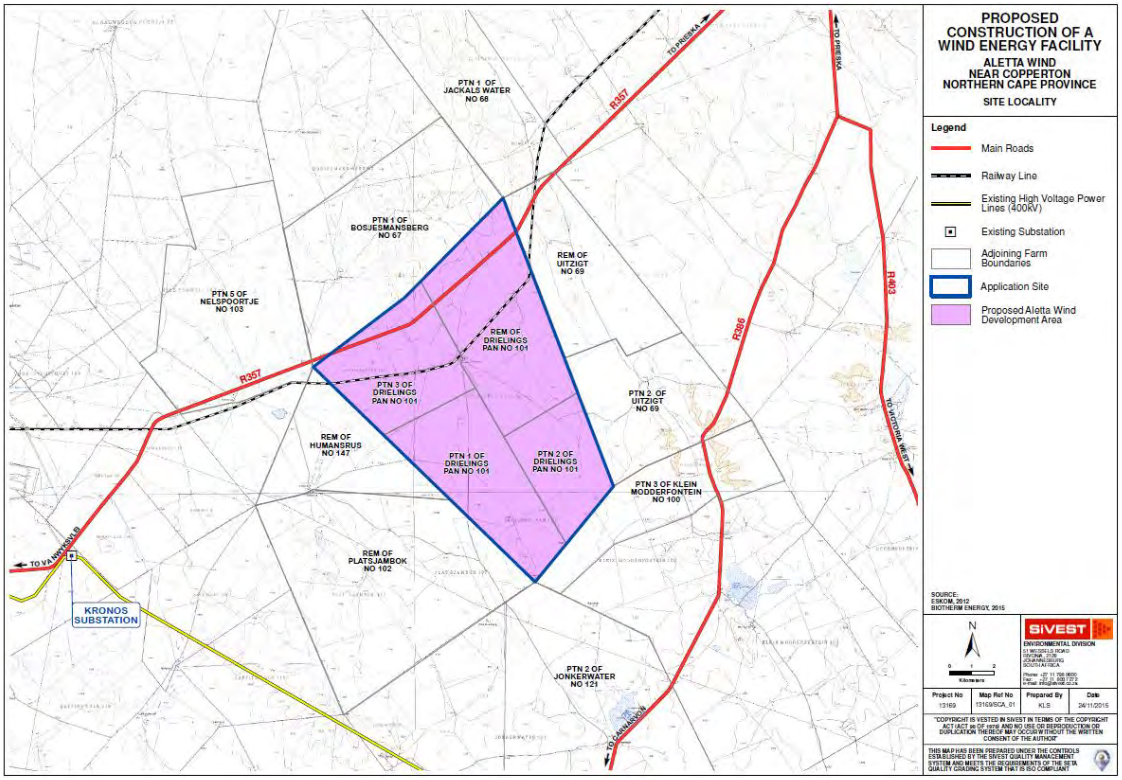


Figure 5-1: Aletta proposed site and land portions

Land uses for the aforementioned portion include could not be obtained at this time but will be investigated during the next phase of study.

The various farm portions and their land uses are described in the table below.

Table 5-1: Land uses in the zone of influence

Farm	Type of effect	Information
Portion1,2,3 and the remainder of Drielingspan no. 101	Directly affected (Wind facility site)	• No information could be obtained due to owners' circumstances • Commercial sheep farming
Portion 1 of Bosjesmansberg no. 67	Adjacent	• No contact information
Remainder of Uitzigt no. 69	Adjacent	• No information could be obtained due to owners' circumstances
Portion 2 of Uitzigt no. 69	Adjacent	• No contact could be made
Portion 3 of Klein Modderfontein no. 100	Adjacent	• No correct contact information available
Portion 2 of Jonkerwater 121	Adjacent	• No contact could be made
Remainder of Platsjambok no. 102	Adjacent	• Commercial sheep farm (7000 ha) • 2 residents living on farm • No labourers • Land owner opinion: Is concerned about the effect that the turbines will have on radio and cell phone signals after the SKA project revealed concerns that it may affect their project.
Remainder of Humansrus no. 147	**Adjacent**	• No answer at provided contact details

The region is also known for various other renewable energy projects such as:

- The solar PV farm in the south east of Copperton
- A wind farm on the Humansrus farmstead in an easterly direction from Copperton
- A wind farm on the original Nelspoortjie farmstead within the same region as the proposed site.

5.2 Resources and land capability

Generally, the area does not have any significant mineral deposits. To the south of Prieska, on the farm Doornfontein, a medium-sized mineral deposit of Phosphate can be found. Various small mineral deposits can be found near Niekerkshoop. These include Tiger's-eye and Crocidolite (i.e. asbestos). Small deposits of Alluvial Diamonds can be found in the Orange River. Other small mineral deposits within the municipal boundary include Salt, Gypsum, Iron and Uranium (Siyathemba LM, 2014).

The arid nature of the associated farm portions creates difficulties for traditional irrigation farming; as a result, commercial farming in the area is limited to sheep/goat farming. These farming types require minimal inputs with respect to water and grazing capacities. Even so, the drought experienced over the last couple of years has resulted in reduced livestock capacities leading to many farmers downscaling their farming activities.

5.3 Access to infrastructure

Bulk infrastructure on the affected farm portions is limited. The R357 is in close proximity to the new site, but other roads will have to be created for transport into the farthest reaches of the proposed site. Electricity supply is sufficient mainly due to existing substation located in Copperton, while access to water remains limited and many farmers have resorted to bore holes for their water supply. Copperton itself does have a water supply network but it is too far away and too expensive to be considered for everyday use by the affected farm portions. There is no existing infrastructure on the proposed site for stormwater pipes, which can be attributed to the arid nature of the region and the fact that it is farmlands, which do not require diversion of heavy rainfall associated water.

As seen from section 4.2 of this document, the LM has not made provision for improving infrastructure in the area due to low population densities and subsequently lower service delivery priority assigned for the area. This might indicate that the responsible company may have to fund the provision of necessary infrastructure.

6 SUMMARY AND POTENTIAL SOCIO-ECONOMIC IMPACTS

BioTherm Energy (Pty) Ltd is proposing to develop a wind energy facility with a total nameplate capacity of 140MW. The project is to be located near Copperton within the Northern Cape Province. The proposed site will directly affect four farm portions of land namely: portion 1, 2, 3 and the remainder of Drielingspan No. 101.

The review of key national and provincial level energy policy documents indicated that the development of energy from renewable sources is strongly supported at both levels. The White Paper on Energy Policy (1998) notes that renewable energy operates from an unlimited resource base and as such, can increasingly contribute towards a long-term sustainable energy future. It additionally notes that 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 renewable applications are the least cost energy service in many cases: more so when social and environmental costs are taken into account. The

Integrated Resource Plan (IRP) 2010-2030 also allocates 43% of new energy generation facilities in South Africa to renewables.

At provincial level, the NC PGDS notes that the availability of inexpensive energy is a key requirement in order to promote economic growth in the Northern Cape. It also notes that the "development of energy sources such as wind, solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which economic opportunity and activity is generated in the Northern Cape".

At local level, the Pixley ka Seme District IDP also recognises renewable energy projects as being in line with identified local economic development objectives and strategies and notes that their promotion could reverse the current trends of decline and lack in diversity of the economy. The Siyathemba Local Municipality believes that renewable energy development is an opportunity for economic development in the municipality and further states that "electricity shortages could be alleviated through local production, which could justify investment in a local solar power plant" (Siyathemba Local Municipality, 2014).

After considering the reviewed documentation, no fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local governments, do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors; mainly agriculture, which is considered to be an economic driver in the local area, where the project is to be developed. Instead, harnessing of renewable energy sources is considered to be the means to drive development and expansion of the local agricultural activities and development of other industries.

The population and the local economy of Siyathemba is relatively small. Although the unemployment rate in the area was on par with the national level, the households in the local municipality have very low-income levels. The local economy in the past has been quite reliant on the mining activities and after a closure of a number of mining and quarrying businesses, suffered major shock. Due to the location and the availability of natural and mineral resources in the area, the economic opportunities in the municipalities are largely limited to agricultural and agro processing industries, as well as small mining activities. The rest of the economy is largely dependent on the purchasing power of the local households.

The above suggests that the economy is in dire need for investment that would diversify its economic base and lead to the improvement of standards of living among local households through the increased income levels and access to improved services, which can be achieved by raising the local municipality's revenue base through taxes and rates paid by new businesses. The proposed project is therefore, likely to create a positive impact on the local economic development and the socio-economic environment in the municipality in general.

Considering the project background and the understanding of the socio-economic environment where the proposed project is to be located, the following impacts are most likely to be raised and will need to be investigated in the EIA phase in greater detail.

Construction phase impacts to be investigated

ISSUE	**Impact: Increase in production and GDP-R of the national and local economies due to project capital expenditure**
DISCUSSION	The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the

	project experience an increase in demand or when businesses servicing households experience an increase in demand for their products.
EXISTING IMPACT	The local economy has a small economic base.
PREDICTED IMPACT	High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Environmental Parameter	*Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods.*	
Issue/Impact/Environmental Effect/Nature	*The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the project experience an increase in demand or when businesses servicing households experience an increase in demand for their products.*	
Extent	*The national economy will experience an increase in production.*	
Probability	*It is most likely that there will be a temporary increase in production during construction.*	
Reversibility	*The impact is irreversible, as the capital spent on the project cannot be paid back.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Short term*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Considering multiplier effects, the total impact on the national economy's output could be more than three times more than the expenditure.*	
Significance Rating	*This is a positive high impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3

Intensity/magnitude	4	4
Significance rating	+64(high positive)	+64 (high positive)
Mitigation measures	*In order to optimise the stimulation of the local economy through direct, indirect, and induced effects, the following should be applied where possible:* ❑ *Procure construction materials, goods, and products from local suppliers if feasible.* ❑ *Employ local contractors where possible.* *The proposed mitigation measures will possibly increase the positive impact in the local economy; however, this will not affect the rating.*	

Environmental Parameter	*Gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country during a year.*	
Issue/Impact/Environmental Effect/Nature	*The impact is generated through capital expenditure that shocks the economy. It results in growth of sectors that include businesses supplying goods and services required for the establishment of the facility and businesses that benefit from the increased consumer expenditure.*	
Extent	*The national economy will experience an increase in GDP-R.*	
Probability	*It is most likely that there will be a temporary increase in GDP-R during construction.*	
Reversibility	*The impact is irreversible, as the capital spent on the project cannot be paid back.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Short term*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*There will be a significant increase in the country's GDP.*	
Significance Rating	*This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	4

Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)
Mitigation measures	❑ *Recruit local labour.* ❑ *Sub-contract to local construction companies.* ❑ *Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.* *The proposed mitigation measures will possibly increase the positive impact in the local economy; however, this will not affect the rating.*	

ISSUE	**Impact: Creation of temporary employment in the local communities and elsewhere in the country**
DISCUSSION	The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed wind facility and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity and in sectors benefiting from the increase of consumer expenditure.
EXISTING IMPACT	The local and national economies have high unemployment rates and government set a target to create 11 million jobs by 2030. Limited employment opportunities exist in the Siyathemba LM.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Environmental Parameter	*Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work.*
Issue/Impact/Environmental Effect/Nature	*The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed development and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity and in sectors benefiting from the increase of consumer expenditure.*
Extent	*Increase in employment will affect the entire country depending on the areas where inputs required are sourced.*

Probability	*It is most likely that there will be a temporary increase in employment during construction.*	
Reversibility	*Irreversible as employment created, albeit for a temporary period, cannot be undone.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Short term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*There will be a notable reduction in unemployment within the Siyathemba LM.*	
Significance Rating	*This is a positive high impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)
Mitigation measures	❑ *Employ labour-intensive measures in construction.* ❑ *Employ local residents.* ❑ *Sub-contract to local construction companies.* ❑ *Utilise local suppliers.* ❑ *Set-up a skills desk at the local municipal office and in the nearby communities to identify skills available in the community and assist in recruiting local labour during both construction and operation.*	

ISSUE	**Impact: Skills development due to the creation of new employment opportunities**
DISCUSSION	The impact takes place during construction and will last beneficiaries for an entire lifetime.
EXISTING IMPACT	The local municipality has a very limited skills base and low educational levels.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes

ISSUE	**Impact: Skills development due to the creation of new employment opportunities**
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general

Environmental Parameter	*Skills development: employment creation gives way to a host of skills transfer and development opportunities in terms of honing an existing skill or acquiring a new skill.*	
Issue/Impact/Environmental Effect/Nature	*The impact takes place during the creation of new employment opportunities, and unlike the actual employment created is sustainable.*	
Extent	*People across the country will have the opportunity to develop their skills.*	
Probability	*Possible – one cannot be certain that people gaining employment during the construction phase will be able to develop or acquire new skills.*	
Reversibility	*Barely reversible - skills obtained cannot be lost unless they are not being used and/or become outdated*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Short term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*High impact on local employees' skills – 39% of the employed people in the Siyathemba LM are unskilled. In the context of the national economy, though this impact will be of a lower magnitude.*	
Significance Rating	*This is a medium positive impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	2	3
Reversibility	3	3
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+42 (medium positive)	+45 (medium positive)
Mitigation measures	❑ *Contractors should provide learnerships and on-job training;* ❑ *Where specialist training can be provided, candidates from local communities should be prioritised for training; and* ❑ *Share knowledge with the sub-contracting companies during the construction period.*	

	These mitigation measures could potentially improve the weighting of the impact in terms of its probability.

ISSUE	**Impact: Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place during construction as a result of jobs created through direct, indirect and induced impacts.
EXISTING IMPACT	The households in the local municipality are on average worse off than in the country in general.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Environmental Parameter	*Household income: the result of a household's member engaging in economic activity; has a direct link to the standard of living of these households.*	
Issue/Impact/Environmental Effect/Nature	*The impact takes place during construction as a result of jobs created through direct, indirect and induced impacts.*	
Extent	*Increase in household income will be nationwide since the temporary increase in employment will affect the entire country.*	
Probability	*Probable - the impact will most likely take place.*	
Reversibility	*Irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Short term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*High – The income earned by households located in the LM as a result of a project is usually on average higher than the average income of these households. The impact within the national economy, though will be less significant.*	
Significance Rating	*This is a medium positive impact. Mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3

Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)
Mitigation measures	❑ *Recruit local labour as far as feasible to increase the benefits to the local households.* ❑ *Employ labour-intensive methods in construction.* ❑ *Sub-contract to local construction companies.* ❑ *Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.*	

ISSUE	**Impact: Increase in government revenue due to investment**
DISCUSSION	The impact will take place as a result of domestic spending on construction activities and will be acquired by government through indirect and direct taxes on the project's activity.
EXISTING IMPACT	Due to limited economic base and low income levels, the local municipality's revenue base is limited, which in turn negatively impacts on its ability to provide adequate services to its residents.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Environmental Parameter	*Government revenue: government obtains its revenue by collecting taxes and rates from the country's residents and business.*
Issue/Impact/Environmental Effect/Nature	*The impact will take place as a result of local expenditure on construction and will be acquired by government through indirect and direct taxes on the project's activity.*
Extent	*The fiscal gain will be collected by the national government and used in the national budget; it is not possible to pinpoint exact regions benefitting from this increase.*
Probability	*Definite - the impact will definitely take place, although one cannot be certain of the exact amount that government will be collecting as a result of this phase of the proposed project.*
Reversibility	*Irreversible.*
Irreplaceable loss of resources	*No loss of resource.*

Duration	*Short term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low – the project will make a small contribution to the national revenue.*	
Significance Rating	*This is a low positive impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+17 (low positive)	+17 (low positive)
Mitigation measures	*No mitigations.*	

ISSUE	**Impact: Potential decrease of efficacy of agricultural land**
DISCUSSION	The proposed project will reduce the efficacy of the agricultural land during the construction phase as may vehicles and equipment would have to be transported onto the land currently used for farming.
EXISTING IMPACT	Based on telephonic conversations with land owners, some commercial agricultural farming takes place on certain portions of the site where the project is to be located.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	The agricultural sector is a key economic driver in the area; its employment in the municipality is on a decline and further losses of agricultural land could worsen the situation.

Environmental Parameter	*Land sterilisation: loss of land to new development.*
Issue/Impact/Environmental Effect/Nature	*The impact will take place as a result of replacement of the low intensity farming activities.*
Extent	*Will affect farms on which project will be developed.*
Probability	*Definite - without the sale/lease of land the project will not go ahead*
Reversibility	*Barely reversible.*

Irreplaceable loss of resources	*Marginal loss of resources.*	
Duration	*Long-term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low – the intensity of agricultural activities is low.*	
Significance Rating	*The impact is low negative. Mitigation may reduce intensity of impact*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-15 (low negative)	-15 (low negative)
Mitigation measures	❑ *Reasonable compensation must be negotiated with the affected farmers.* ❑ *Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented.* ❑ *Implementation of rehabilitation measures.*	

ISSUE	**Impact: Change in demographics of the area due to influx of workers and job seekers**
DISCUSSION	The construction activities will attract job seekers and will involve the migration of construction workers to the site.
EXISTING IMPACT	The local area's labour force is not sufficiently diversified to provide all skills necessary during construction.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

ISSUE	**Impact: Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)**
DISCUSSION	The construction activities may attract job seekers and may involve the migration of construction workers to the site. The increase in the number of job seekers and migrants in the municipality could cause an increase in social pathologies.
EXISTING IMPACT	The local area is not sufficiently diversified to provide all skills and workers necessary during construction. Some farms where the project is to be built also host some residents and livestock.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Environmental Parameter	*Social pathologies - social factors such as deterioration of health; increase in crime; prostitution; and drugs among others.*	
Issue/Impact/Environmental Effect/Nature	*Potential impacts on social factors associated with the presence of construction workers and job seekers.*	
Extent	*The local community.*	
Probability	*Probable.*	
Reversibility	*Partly reversible. However, in the case of HIV and AIDS, the impact is irreversible.*	
Irreplaceable loss of resources	*This impact could be associated with some losses of personal goods and livestock.*	
Duration	*Short-term.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low.*	
Significance Rating	*The impact is low negative - requires development of the local manufacturing capabilities.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	1	1
Cumulative effect	3	3

Intensity/magnitude	1	1
Significance rating	-13 (low negative)	-12 (low negative)
Mitigation measures	*The developers could implement the following measures to limit the occurrence of an increase in social pathologies:* ❑ *Employ locals as far as feasible through the creation of the local skills database and recruitment of suitable candidates.* ❑ *Set up a gate or access control to site to limit or completely eliminate the possibility of livestock theft and burglaries at the residential properties.* ❑ *Control the movement of workers between the site and areas of residence to minimise loitering.* ❑ *The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.* ❑ *Implementing health awareness campaigns to curb the potential of spreading disease, use of drugs, or alcohol abuse for example.*	

ISSUE	**Impact: Added pressure on basic services and social and economic infrastructure**
DISCUSSION	If the project attracts a great number of workers and job seekers, this could put further pressure on the local municipality as it will increase the demand for basic services, social and economic infrastructure.
EXISTING IMPACT	The situation regarding access to services in the area appears to be well managed; however, gaps in certain service provision do exist.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Environmental Parameter	*Basic services and social and economic infrastructure: this includes housing, water and sanitation, electricity, roads, clinics, recreational facilities*
Issue/Impact/Environmental Effect/Nature	*The influx of jobseekers to the area and migration of workers will increase the demand for basic services, as well as social and economic infrastructure in the area.*

Extent	*The added pressure on infrastructure will be felt by the local municipality.*	
Probability	*Possible.*	
Reversibility	*This impact is partly reversible but will require significant investment to provide adequately for the area with a temporary increase in population and straining infrastructure.*	
Irreplaceable loss of resources	*This impact is not associated with any losses of resources; however, deterioration of man-made infrastructure is probable.*	
Duration	*Medium-term - impacts may last post the construction phase until mitigated.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low - considering that there are no existing challenges with regards to basic service delivery.*	
Significance Rating	*The impact is low negative.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	2	2
Reversibility	2	2
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-12 (low negative)	-12 (low negative)
Mitigation measures	❑ *Engage with local authorities and inform them of the development as well discuss with them the ability of the municipality to meet the demands for social and basic services created by the migrant construction workers.* ❑ *Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate further (especially the local roads).*	

Operational phase impacts to be investigated

ISSUE	**Impact: Sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities**
DISCUSSION	The impact will take place as a result of operational expenditure on the wind farm, which will also create sustainable multiplier effects.
EXISTING IMPACT	The local economy has a small economic base and the need to diversify the economy is dire.
PREDICTED IMPACT	Moderate to High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Pixley ka Seme district and province.

Environmental Parameter	*Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods.*	
Issue/Impact/Environmental Effect/Nature	*The impact results from sustainable production of the facility, as well as procurement of goods and services required for its sustainable operations and creation of sustainable employment opportunities through direct and indirect effects.*	
Extent	*The national economy will experience an increase in production*	
Probability	*It is most likely that there will be an increase in production.*	
Reversibility	*The impact is irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*This impact is rated as long-term since it will be experienced over the entire operational life of the project.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Medium.*	
Significance Rating	*This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)

Mitigation measures	*The project should aim to benefit the local economy as far as possible and feasible by opting for procurement of local goods and services. However, this will not affect the rating.*

Environmental Parameter	*Gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country during a year.*	
Issue/Impact/Environmental Effect/Nature	*The impact is generated through continuous operation of the facility. It stimulates economic activities of directly and indirectly affected businesses, which subsequently leads to the creation of new business sales and generation of value added. Through increased household expenditure, an additional round of value adding is created.*	
Extent	*The national economy will experience an increase in GDP-R.*	
Probability	*It is most likely that there will be an increase in GDP-R during operations.*	
Reversibility	*The impact is irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*This impact is rated as long-term since it will be experienced over the entire operational life of the project.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Medium - The direct impact associated with the project will lead to the change in the local economy's structure but will have a diluted effect on the national economy.*	
Significance Rating	*This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)
Mitigation measures	❑ *Investigate local procurement opportunities.* ❑ *Procurement from local suppliers should be encouraged if feasible to the viability of the facility.*	

ISSUE	**Impact: Creation of long-term employment in local and national economies through operation and maintenance activities**
DISCUSSION	The impact will take place as a result of operational expenditure on the wind farm, which will also create sustainable multiplier effects
EXISTING IMPACT	The local economy has a high unemployment rate, which means that the area is in need for investment that would create new sustainable employment opportunities.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the district and province.

Environmental Parameter	*Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work.*	
Issue/Impact/Environmental Effect/Nature	*The project is expected to create significant employment opportunities during itsoperational lifespan, and will also create and support additional employment opportunities through multiplier effects.*	
Extent	*Increase in employment will affect the entire country depending on the areas where inputs required are sourced.*	
Probability	*It is most likely that there will be an increase in employment during operations.*	
Reversibility	*The impact is irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Long-term – the created employment opportunities are expected to last for the duration of the project.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low – there will be some reduction in unemployment within the Siyathemba LM*	
Significance Rating	*This is a positive low impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4

Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+16 (low positive)	+16 (low positive)
Mitigation measures	❑ *Where possible, the employment of local labour should be practiced to increase the benefit to the local community through prevention of leakage of buying power.* ❑ *Local small businesses should also be approached to investigate the possibility of supplying inputs for maintenance and operations where viable, this should increase local indirect employment creation.*	

ISSUE	**Impact: Skills development due to the creation of new sustainable employment opportunities**
DISCUSSION	The impact takes place during operations of the wind farm and occurs due to on-job training.
EXISTING IMPACT	The local municipality has a very limited skills base and poor educational levels.
PREDICTED IMPACT	Low to Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could increase considering the other renewable energy projects that are planned for the district and province.

Environmental Parameter	*Skills development: employment creation gives way to a host of skills transfer and development opportunities in terms of honing an existing skill or acquiring a new skill.*
Issue/Impact/Environmental Effect/Nature	*The impact takes place through the creation of employment opportunities during operations, and unlike the actual employment created is sustainable.*
Extent	*People across the country will have the opportunity to develop their skills.*
Probability	*Possible – one cannot be certain that people gaining employment during the operational phase will be able to develop or acquire new skills.*
Reversibility	*Irreversible; skills once gained cannot be lost.*
Irreplaceable loss of resources	*No loss of resource.*
Duration	*Permanent – the skills transferred will remain after the life of the project*

Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Impact is rated as being of low intensity due to the nature of skills required for the operations.*	
Significance Rating	*This impact is given a significance rating of low positive. Enhancement measures exist that can be implemented to ensure that skills development does take place which would improve the probability rating of this impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	2	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+18 (low positive)	+19 (low positive)
Mitigation measures	*In order to improve the chances of skills being developed during the operational period it is recommended that vocational skills transfer/training programmes be developed and knowledge sharing among employees encouraged. This mitigation measure could potentially improve the weighting of the impact in terms of its probability and increase it significance slightly.*	

ISSUE	**Impact: Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place as a result of jobs created through direct, indirect and induced impacts
EXISTING IMPACT	The households in the local municipality are on average worse off than in the country in general.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could increase considering the other renewable energy projects that are planned for the district and province.

Environmental Parameter	*Household income: the result of a household's member engaging in economic activity; has a direct link to the standard of living of these households.*

Issue/Impact/Environmental Effect/Nature	*The impact takes place during operations as a result of jobs created through direct, indirect and induced impacts*	
Extent	*Increase in household income will be nationwide since the sustainable increase in employment will affect the entire country*	
Probability	*Probable - the impact will most likely take place*	
Reversibility	*Irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Long-term – the created employment opportunities are expected to last for the duration of the project.*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Medium intensity*	
Significance Rating	*This is a medium positive impact. Mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)
Mitigation measures	*Local procurement of labour and required goods and services should be encouraged as far as feasible to increase the benefit to the local households. This, though, will not affect the overall rating.*	

ISSUE	**Impact: Increase in government revenue stream**
DISCUSSION	The project, through its operations, will contribute to government revenue through payments of income taxes and payroll taxes.
EXISTING IMPACT	The local tax base is small, which limits the ability of the municipalities to provide quality services.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the district and province.

Environmental Parameter	*Government revenue: government obtains its revenue by collecting taxes and rates from the country's residents and business.*	
Issue/Impact/Environmental Effect/Nature	*The impact takes place mostly with payment of royalties and corporates taxes, as well as a result of payment of salaries and wages and declaration of dividends.*	
Extent	*The fiscal gain will be collected by the national government and used in the national budget; it is not possible to pinpoint exact regions benefitting from this increase.*	
Probability	*Definite - the impact will definitely take place, although one cannot be certain of the exact amount that government will be collecting as a result of this phase of the proposed project.*	
Reversibility	*Irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Long-term*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low – the project will make a small contribution to the national revenue.*	
Significance Rating	*This is a low positive impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+19 (low positive)	+19 (low positive)
Mitigation measures	*No mitigations.*	

ISSUE	**Impact: Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan**
DISCUSSION	The project will form part of the Independent Power Producer Procurement Programme that implies that the operating company allocates a certain percentage of the project's revenue towards community development.
EXISTING IMPACT	The closest populated community to the project is Copperton, followed by Prieska; both have a very small economic base and poor levels of education.
PREDICTED IMPACT	Moderate to High Positive

ISSUE	**Impact: Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan**
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Environmental Parameter	*SED and ED initiatives; as part of the RE IPPP programme, project owners are required to spend a portion of their turnover on the upliftment of the community where the project is located.*	
Issue/Impact/Environmental Effect/Nature	*Currently the economic base of Siyathemba LM is small, and the anticipated injection will have a significant positive impact on the standard of living of its community.*	
Extent	*The impact will affect the local municipality; it is envisaged to be geared towards Copperton and nearby villages due to their proximity to the site but could potentially be extended in the future.*	
Probability	*Definite - the impact will definitely take place.*	
Reversibility	*Irreversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Long-term – throughout the operational period*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low – the project will make an average contribution to the local economy.*	
Significance Rating	*Low positive impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+17 (low positive)	+17 (low positive)

Mitigation measures	*It is recommended that the project owner develops practical SED and ED programmes throughout the project's lifespan. The plan should be developed in consultation with local authorities and existing strategy documents to identify community projects that would result in the greatest social benefits. With regard to ED initiatives, focus should be on developing plans to support and create sustainable, self-sufficient enterprises. It is important that these plans be reviewed annually and where possible updated.*

ISSUE	**Impact: Altered sense of place**
DISCUSSION	The project is expected to have some visual impact, which will alter the landscape and ultimately affect the sense of place among local residents and possibly business visitors to the Alkantpan Testing Range.
EXISTING IMPACT	The area where the project is to be located is sparsely populated and does not possess any tourist attractions.
PREDICTED IMPACT	Negligible Negative
EIA INVESTIGATION REQUIRED	No
CUMULATIVE EFFECT	Could be increased considering the other renewable energy projects that are planned for the Siyathemba LM.

Environmental Parameter	*Sense of place, living and working conditions: these conditions are influenced by a variety of factors and can be quite subjective as each factor has a varying degree of influence for each person depending on what each individual's values are.*	
Issue/Impact/Environmental Effect/Nature	*Operation activities will have a significant visual impact on the areas in close proximity to the development site.*	
Extent	*The biggest impact will be felt close to the project site.*	
Probability	*Definite - the impact will definitely take place.*	
Reversibility	*Completely reversible.*	
Irreplaceable loss of resources	*No loss of resource.*	
Duration	*Long-term – throughout the operational period*	
Cumulative effect	*High, as there are a number of planned renewable energy developments in the area.*	
Intensity/magnitude	*Low*	
Significance Rating	*Low negative impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	4

Reversibility	1	1
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-13 (low negative)	-13 (low negative)
Mitigation measures	*The mitigation measures proposed by the visual specialist should be adhered to.*	

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Appendix 7
Public Participation

When public participation was initiated in March 2016 it was run concurrently with the proposed BioTherm Eureka East and Eureka West wind energy facilities. The Eureka facilities have subsequently been placed on hold indefinitely and recent public participation documents therefore refer only to the proposed Aletta facility.

Appendix 7A
Proof of Site Notices

ENVIRONMENTAL IMPACT ASSESSMENTS AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPRs) FOR THE PROPOSED DEVELOPMENT OF THE ALTETTA 140MW WIND ENERGY FACILITY AND BASIC ASSESSMENT (BA) FOR THE ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

(DEA Reference Numbers to be issued)

Co-ordinates: 29°55'27.2"S & 22°30'31.58"E

Figure 1: Entrance to the Farm Drielings Pan No 103, Ptns 2, 8, 9 and Reminder (PV Site), off the R357

Figure 2: Left gate post of the entrance gate to Farm Drielings Pan (English site notice)

Figure 3: Afrikaans site notice on left gate post

SiVEST
Environmental Division

SiVEST

Established in 1952

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as amended and the Environmental Impact Assessment (EIA) Regulations, under Government Notices No R982, R983, R984 and R985 promulgated on 4 December 2014, notice is hereby given that BioTherm Energy (Pty) Ltd has appointed SiVEST SA (Pty) Ltd, as the independent Environmental Assessment Practitioner (EAP), to undertake the required EIA and public participation processes for the above-mentioned proposed projects:

PROJECT DESCRIPTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) are proposing to develop three (3) 140MW Wind Energy Facilities (hereafter referred to as the "proposed development") near Copperton, Northern Cape Province. The proposed development will consist of the 140MW Eureka East, 140MW Eureka West and 140MW Aletta Wind Energy Facilities (WEFs). In addition, BioTherm are proposing to construct two substations and two 132kV power lines in order to connect the proposed WEFs to the national grid. The Eureka Substation and 132kV power line will be shared between Eureka East WEF and Eureka West WEF, and the Aletta Substation and 132kV power line will be used for Aletta WEF. The overall objective of the project is to generate electricity to feed into the national Eskom grid.

As such, three (3) EIAs will be undertaken, one for each proposed WEF. In addition, two (2) BAs will be undertaken, one for each substation and 132kV power line. Although each WEF and the electrical infrastructure will be assessed separately, a single Public Participation Process is being undertaken for all five (5) projects.

PROJECT LOCATION

The proposed projects are located within the Northern Cape Province. They fall within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality. The projects include the following farms:

Eureka East WEF:	Remainder of Witfontein No. 54; Portion 3 of Blaauwbosch Poortje No. 66
Eureka West WEF:	Portion 8 of Nelspoortje No. 103; Portion 9 of Nelspoortje No. 103; Portion 2 of Blaauwbosch Poortje No. 66; Remainder of Blaauwbosch Poortje No. 66
Aletta WEF:	Portion 1 of Drielings Pan No.101 Portion 2 of Drielings Pan No.101 Portion 3 of Drielings Pan No.101 Remainder of Drielings Pan No.101

To register as an Interested and / or Affected Party (I&AP) and / or to obtain additional information please submit your name, contact details and the interest which you have in the application to the EAP below:

Andrea Gibb or **Lynsey Rimbault**

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SiVEST
Omgewingsafdeling

SiVEST
Gestig in 1952

OMGEWINGSIMPAKEVALUERINGS (OIE's) EN OMGEWINGSBESTUURSPROGRAMME (OBPR'e) VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA's), EN BASIESE EVALUERINGS (BE's) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

Ingevolge die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998) (NEMA) soos gewysig en die Regulasies op Omgewingsimpakevaluerings (OIE-regulasies), ingevolge Staatskennisgewing R982, R983, R984 en R985 wat op 4 Desember 2014 afgekondig is, geskied kennis hiermee dat BioTherm Energy (Edms.) Bpk. SiVEST SA (Edms.) Bpk. aangestel het as die onafhanklike Omgewingsevalueringspraktisyn (OEP) om die nodige OIE en openbare deelnameproses vir die bogenoemde beoogde projekte te onderneem:

PROJEKBESKRYWING

BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) beoog die ontwikkeling van drie (3) 140 MW Windkragaanlegte (hierna die "beoogde ontwikkeling" genoem) naby Copperton in die Noord-Kaapprovinsie. Die beoogde ontwikkeling sal bestaan uit die 140 MW Eureka-Oos, 140 MW Eureka-Wes en 140 MW Aletta Windkragaanlegte (WKA's). Daarbenewens beoog BioTherm die oprigting van twee (2) substasies en twee (2) 132 kV kraglyne ten einde die beoogde WKA's met die nasionale kragnet te verbind. Die Eureka Substasie en 132 kV kraglyn sal gedeel word tussen die Eureka-Oos WKA en die Eureka-Wes WKA, en die Aletta Substasie en 132 kV kraglyn sal vir die Aletta WKA gebruik word. Die oorkoepelende doelwit van die projek is om elektrisiteit op te wek om by Eskom se nasionale kragnet in te voer.

Derhalwe sal drie (3) OIE's onderneem word; een vir elk van die beoogde WKA's. Daarbenewens sal twee (2) BE's onderneem word; een vir elke substasie en 132 kV kraglyn. Hoewel elk van die WKA's en die elektriese infrastruktuur apart geevalueer sal word, word 'n enkele Openbare Deelnameproses vir al vyf (5) van die projekte onderneem.

PROJEKLIGGING

Die beoogde projekte is in die Noord-Kaapprovinsie geleë. Hulle van in die Siyathemba Plaaslike Munisipaliteit en die Pixley ka Seme Distriksmunisipaliteit. Die projekte sluit die volgende plase in:

Eureka-Oos WKA:	Restant van Witfontein No. 54; Gedeelte 3 van Blaauwbosch Poortje No. 66.
Eureka-Wes WKA:	Gedeelte 8 van Nelspoortje No. 103; Gedeelte 9 van Nelspoortje No. 103; Gedeelte 2 van Blaauwbosch Poortje No. 66; die Restant van Blaauwbosch Poortje No. 66.
Aletta WKA:	Gedeelte 1 van Drielings Pan No. 101; Gedeelte 2 van Drielings Pan No. 101; Gedeelte 3 van Drielings Pan No. 101; die Restant van Drielings Pan No. 101.

Ten einde as 'n Belangstellende en/of Geaffekteerde Party (B&GP) te registreer en/of om meer inligting te bekom, dien asseblief u naam, kontakbesonderhede en die belang wat u by die aansoek het by die OEP hieronder in.

Andrea Gibb of **Lynsey Rimbault**

SiVEST Environmental
Posbus 2921
RIVONIA
2128

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Faks: 011 803 7272
E-pos: andreag@sivest.co.za of lynseyr@sivest.co.za
Webwerf: www.sivest.co.za

Appendix 7B
Written Notices

SiVEST
Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
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Email info@sivest.co.za
www.sivest.co.za

Established 1952

Your reference	N/A
Our reference	13169
Date	18 March 2016

Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

- **EUREKA EAST WEF – DEA Ref No: To be announced**
- **EUREKA WEST WEF – DEA Ref No: To be announced**
- **ALETTA WEF – DEA Ref No: To be announced**
- **EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced**
- **ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced**

- **INVITATION TO PARTICIPATE IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS**

In terms of the EIA Regulations and the National Environmental Management Act, 1998 (Act No. 107 of 1998), SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) has been appointed as the independent Environmental Assessment Practitioner (EAP) by BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) to conduct the EIA processes for the proposed development of the Eureka East, Eureka West and Aletta 140MW WEFs, and the BA processes for the two (2) associated substations and 132kV power lines. The proposed projects are located in the Northern Cape Province near Copperton.

SiVEST would like to invite you, as a potential Interested and/or Affected Party (I&AP), to become actively involved in the EIA and Public Participation Process (PPP) for this proposed project. The aim of this process is as follows:

- to ensure that all the relevant environmental impacts are taken into consideration;
- to ensure public input; and
- provide decision-makers with sufficient information to make an informed decision on the proposed activities.

Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.

Yours sincerely,

Andrea Gibb
Environmental Practitioner
SiVEST Environmental Division

encl: Background Information Document (BID)
Registration and Comment Form

SiVEST
Environmental

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Gestig in 1952

U verwysing	N.V.T.
Ons verwysing	13169
Datum	18 Maart 2016

Geagte Belangstellende en/of Geaffekteerde Party

OMGEWINGSIMPAKEVALUERINGS (OIE's) EN OMGEWINGSBESTUURSPROGRAMME (OBPR'e) VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA's), EN BASIESE EVALUERINGS (BE's) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

- **EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word**
- **EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word**
- **ALETTA WKA – DO Verw. No.: Moet aangekondig word**
- **EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word**
- **ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word**

- **UITNODIGING OM DEELNAME AAN DIE OMGEWINGSIMPAKEVALUERINGSPROSES**

Ingevolge die OIE-regulasies en die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998), is SiVEST SA (Edms.) Bpk. (hierna SiVEST genoem) deur BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) aangestel as die onafhanklike Omgewingsevalueringspraktisyn (OEP) ten einde die OIE-prosesse vir die beoogde ontwikkeling van die Eureka-Oos, Eureka-Wes en Aletta 140 MW WKA's en die BE-prosesse vir die twee (2) gepaardgaande substasies en 132 kV kraglyne te onderneem. Die beoogde projekte is naby Copperton in die Noord-Kaapprovinsie geleë.

SiVEST nooi u, as 'n potensiële Belangstellende en/of Geaffekteerde Party (B&GP), om aktief by die OIE en Openbare Deelnameproses (ODP) vir hierdie beoogde projek betrokke te raak.

Die doel van hierdie proses is om:
- toe te sien dat al die tersaaklike omgewingsimpakte in ag geneem word;
- openbare insette te verseker; en
- besluitnemers van voldoende inligting te voorsien ten einde 'n ingeligte besluit oor die beoogde aktiwiteite te neem.

Aangeheg is die Agtergrondinligtingsdokument (AID) wat inligting rakende die beoogde projek, asook die beoogde OIE BE en ODP bevat.

Deur die meegaande registrasie- en kommentaarvorm in te vul en in te dien, sal u as 'n B&GP op die projek se databasis geregistreer word.

Ons bedank u by voorbaat dat u deel word van die Openbare Deelnameproses en ons sien daarna uit om u waardevolle insette betreffende die beoogde projek te ontvang.

Die uwe

Andrea Gibb
Omgewingspraktisyn
SiVEST Omgewingsafdeling

Ingeslote dokumentasie: Agtergrondinligtingsdokument (AID)
Registrasie- en Kommentaarvorm

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

- **EUREKA EAST WEF – DEA Ref No: To be announced**
- **EUREKA WEST WEF – DEA Ref No: To be announced**
- **ALETTA WEF – DEA Ref No: To be announced**
- **EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced**
- **ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced**

INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) are proposing to develop three (3) 140MW Wind Energy Facilities (hereafter referred to as the "proposed development") near Copperton within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality in the Northern Cape Province. The proposed development will consist of the 140MW Eureka East, 140MW Eureka West and 140MW Aletta Wind Energy Facilities (WEFs). In addition, BioTherm are proposing to construct two substations and two 132kV power lines in order to connect the proposed WEFs to the national grid. The Eureka Substation and 132kV power line will be shared between Eureka East WEF and Eureka West WEF, and the Aletta Substation and 132kV power line will be used for Aletta WEF. The overall objective of the project is to generate electricity to feed into the national Eskom grid.

In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa, each wind energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation (EA). Each substation and 132kV power line will also require a separate EA.

The EIAs and BAs will be conducted in terms of the 2014 EIA Regulations promulgated in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), which came into effect on the 8th of December 2014. In terms of these regulations, Environmental Impact Assessments (EIAs) will be required for the proposed WEFs and Basic Assessments (BAs) will be required for the associated power lines. As such, three (3) EIAs will be undertaken, one for each proposed wind energy facility. In addition, two (2) BAs will be undertaken, one for each substation and 132kV power line. Although each WEF and the electrical infrastructure will be assessed separately, a single public participation process is being undertaken for all five (5) proposed projects. The potential environmental impacts associated with all five (5) projects will be assessed during the EIAs and BAs as part of a cumulative impact assessment.

All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA and BA processes and will be complied with at all times. BioTherm has therefore appointed SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) as the independent Environmental Assessment Practitioner (EAP), to undertake the required EIA and BA processes in terms of the NEMA.

PURPOSE OF THIS DOCUMENT

The purpose of this Background Information Document (BID) is to inform Interested and/or Affected Parties (I&APs) about the EIA and BA processes that are being conducted for the proposed development.

In addition to supplying information about the proposed project and the environmental processes, this BID will also provide I&APs with the opportunity to:

- Better understand the proposed development in order to provide comments and raise issues of concern;
- Understand the EIA and BA process in order to participate effectively;
- Make suggestions to enhance the proposed development;
- Comment on the specialist studies that will be conducted; and
- Contribute local knowledge.

BACKGROUND TO THE PROPOSED PROJECT

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. In response to this goal; BioTherm are proposing to establish three (3) 140MW export capacity WEFs near Copperton in the Northern Cape Province. The overall objective of the project is to generate electricity to feed into Eskom's national electricity grid by means of renewable energy technologies.

WHY USE WIND ENERGY?

The benefits of using wind energy include:

- WEFs have the capability of delivering large-scale utility power;
- Wind energy is renewable, clean and non-polluting (greenhouse gases etc.), and does not produce by-products (atmospheric contaminants or thermal pollution) that could be harmful to the environment;
- WEFs are generally well suited to rural areas and therefore have a reduced impact on agriculture compared to other electricity generating options;
- WEFs can also contribute to economic growth in these regions;
- Wind energy is one of the lowest-cost producers of electricity;
- Localised production of energy reduces transmission line losses associated with transmitting electricity over long distances; and
- WEFs improve energy security for South Africa, reducing dependency on fossil fuels.

PROJECT LOCATION

The proposed project is located within the Northern Cape Province. It falls within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality. The project sites have been identified through pre-feasibility studies conducted by BioTherm based on availability of suitable wind resource, grid connection suitability, competition, flat topography, land availability and site access. Project specific locality details are included below:

Eureka East WEF

The proposed project is located approximately 15km north east of Copperton and has an area of 6950 ha. The project includes the following farms:

- Remainder of Witfontein No. 54;
- Portion 3 of Blaauwbosch Poortje No. 66

Eureka West WEF

The proposed project is located approximately 6km north east of Copperton and has an area of 6118 ha. The project includes the following farms:

- Portion 8 of Nelspoortje No. 103;
- Portion 9 of Nelspoortje No. 103;
- Portion 2 of Blaauwbosch Poortje No. 66;
- Remainder of Blaauwbosch Poortje No. 66

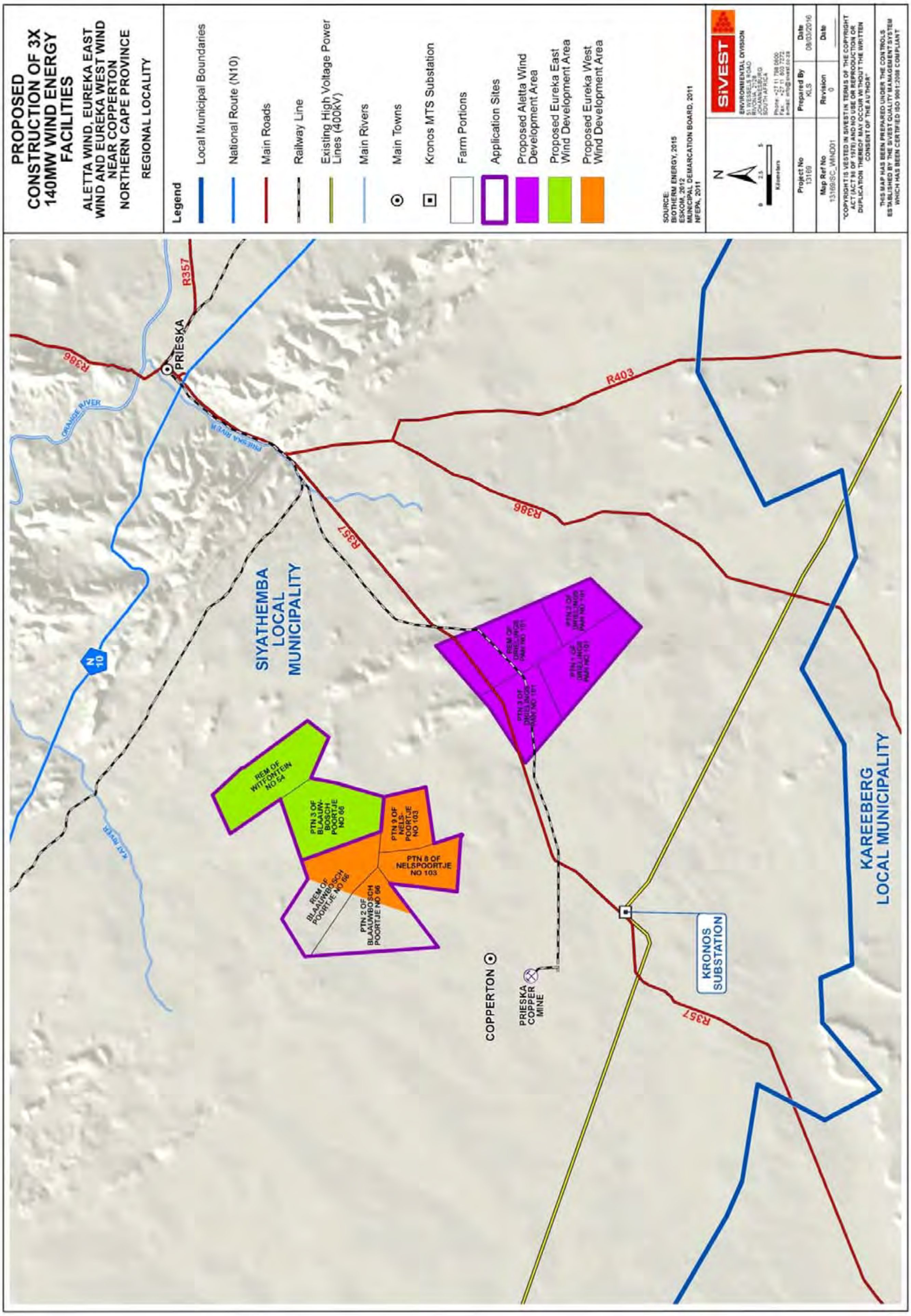
Aletta WEF

The proposed project is located approximately 20km east of Copperton and has an area of 11002 ha. The project includes the following farms:

- Portion 1 of Drielings Pan No.101
- Portion 2 of Drielings Pan No.101
- Portion 3 of Drielings Pan No.101
- Remainder of Drielings Pan No.101

The application sites for the three (3) proposed WEFs are shown on the locality map below (**Figure 1**). The route corridor alternatives for the associated 132kV power lines will be provided during the BA processes for each power line and substation.

Figure 1: Locality Map



EIA / BA PROCESSES

What is an EIA?

An EIA is a process of collecting, organising, analysing, interpreting and communicating information that is relevant to consider a particular environmental application. EIAs are used by planning authorities/developers to obtain an independent and objective view of the potential environmental (biophysical and social) impacts that could arise during the construction and operation of the proposed development. This information needs to provide the Competent Authority with a sound basis for their decision-making.

What is a BA?

A BA is a similar process to an EIA, but is undertaken where the impacts are less likely to have significant impacts on the receiving environment. Like EIAs, BAs identify potential environmental impacts and provide the Competent Authority with a sound basis for their decision-making.

Legal Requirements

According to the NEMA as amended, an EIA process is required for the proposed wind energy facilities as several listed notice 2 activities (GN R. 984) are triggered by each proposed project. A BA process is required for the associated power lines as several listed notice 1 activities (GN R. 983) are triggered by each proposed project.

The EIA and BA processes that will be followed are illustrated in Figure 2 and Figure 3 below.

Competent Authority

The Competent Authority for this proposed projects is the DEA. However, the provincial authority will also be consulted (i.e. the Northern Cape Department of Environment and Nature Conservation (NC DENC)).

Environmental issues to be investigated during the EIA and BA

Various environmental parameters have been identified that will require investigation for the proposed development. These are listed in **Table 1** below.

Table 1. List of specialists and specialist studies to be undertaken for the proposed development

SKILL	NAME
Biodiversity	David Hoare – David Hoare Consulting
Avifauna	Chris van Rooyen – Chris van Rooyen Consulting
Bats	Werner Marais – Animalia
Surface Water	Shaun Taylor – SiVEST
Agricultural Potential	D.G. Paterson – ARC Institute for Soil, Climate and Water
Visual	Andrea Gibb and Stephan Jacobs - SiVEST
Noise	Adrian Jongens – Jongens Keet Associates
Heritage	Wouter Fourie – PGS
Socio-economic	Memory Madondo – Urban-Econ Development Economists
Public Participation	Nicolene Venter – Zitholele Consulting

Figure 2: EIA process diagram

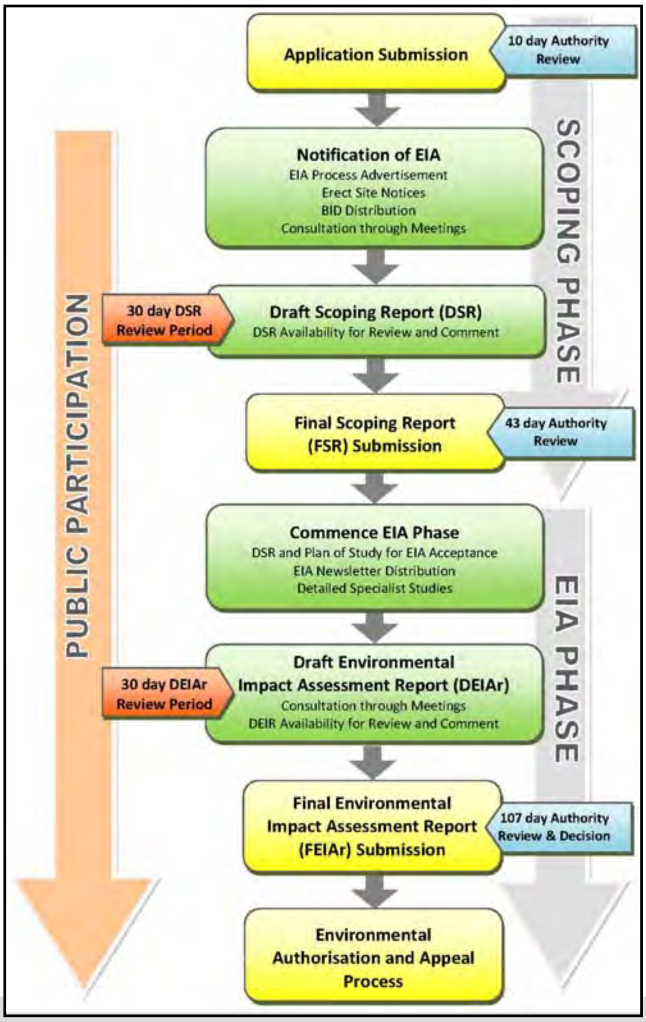
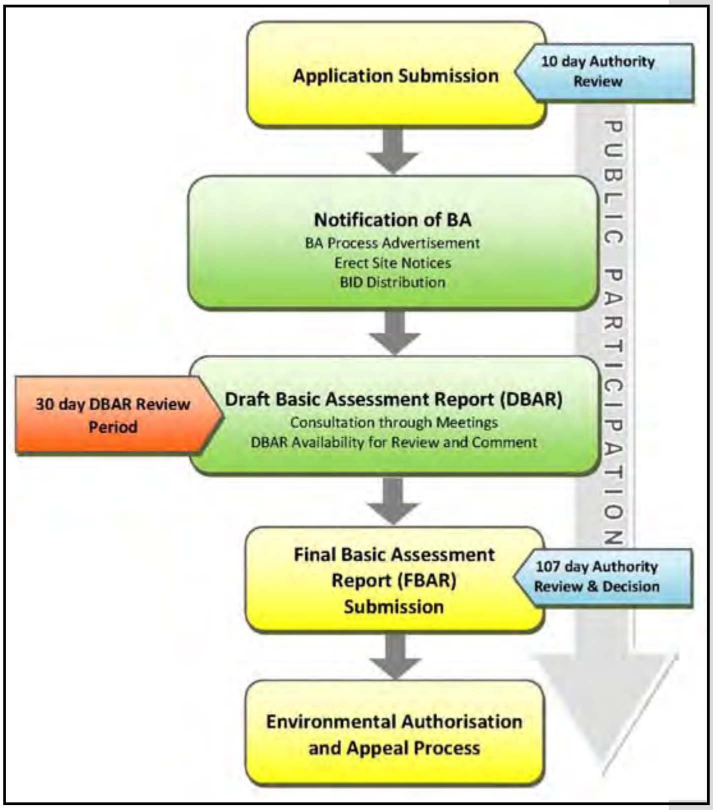


Figure 3: BA process diagram



THE PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA or BA, as it will be for this proposed projects. The principles of NEMA govern many aspects of an EIA or BA, including public participation. The key objective of public participation during the EIA and BA will be to provide I&APs with sufficient and relevant information and to conduct a transparent consultation process on an on-going basis, in order to ensure effective participation throughout the EIA and BA processes. As part of this public participation process you will also be provided with the opportunity to comment on the environmental findings as per the EIA and BA reports (Scoping, Impact Assessment and Basic Assessment), which will be made available for public review and comment during the processes.

It is important that relevant I&APs and Stakeholders are identified and involved in the public participation process from the outset of the proposed projects. As a registered I&AP, you will receive personal notifications, via e-mail, post, fax, and/or sms (where applicable), notifying you of all documents available for comment, the comment periods and the upcoming meetings.

Your responsibilities as an I&AP

In terms of the EIA Regulations, your attention is drawn to your responsibilities as an I&AP, which are to:

- Participate in the EIA and BA processes, register yourself on the project database;
- Inform any other parties (neighbours, friends, colleagues, etc.) who may be interested and/or affected by the proposed project about the EIA and BA processes and encourage them to become involved; and
- Ensure that any comments regarding the proposed projects are submitted within the legislated timeframes which will be communicated to you.

Our responsibilities as the independent EAP

In terms of the EIA Regulations, our responsibilities in the public consultation process include:

- Ensuring that sufficient information regarding the proposed project is made available to you, either through the BID or providing information as and when requested;
- Ensuring that you have an understanding of the proposed project to be able to comment informatively, and to enable you to submit any concern in an informed manner; and
- Ensuring that the following actions are taken upon receiving any comments/queries/issues:
  - ❑ The contact details provided by you will be entered into the project database;
  - ❑ You will be sent all further information releases; and
  - ❑ If you send us queries or comments, we will respond in writing (either via e-mail or within the comments and response report).

How to become involved

If you wish to register as an I&AP, you can do so by the following methods:

- Respond (by phone, fax, post or e-mail) to our invitation for your participation, which has been advertised in the printed media;
- Post, fax or e-mail the attached Registration and Comment Form to SiVEST;
- Attend the meetings to be held during the course of the project. Should you register as an I&AP you will automatically be invited to attend these meetings;
- Contact us telephonically should you have a query, comment or require further project information; and
- Submit comments on the Draft Scoping Report (DSR) and/or the Draft Environmental Impact Assessment Report (DEIAr) and/or the Draft Basic Assessment Report (DBAR) within the review periods that will be stipulated.

If you consider yourself an I&AP for these proposed projects, we urge you to make use of the opportunities created by the public participation process to become actively involved in the process and provide comment or concerns which affect and/or interest you, or about which you would like more information. Your input into this process forms a key part of the environmental studies and we would like to hear from you to obtain your views on the proposed project.

By completing and submitting the accompanying Registration and Comment Form, you automatically register yourself as an I&AP for this proposed projects, ensuring that your comments and/or concerns raised regarding the proposed projects will be noted and addressed. The EAP will respond to all comments and queries received during the course of the EIA and BA.

Please be informed that all relevant public documents can be downloaded from the SiVEST's website.

We look forward to your contributions

Contact: Andrea Gibb or Lynsey Rimbault

PO Box 2921, RIVONIA, 2128

☎ Phone: (011) 798 0600

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Fax: (011) 803 7272

LIST OF ACRONYMS

BA	Basic Assessment
BID	Background Information Document
DBAR	Draft Basic Assessment Report
DEA	Department of Environmental Affairs
DEIAr	Draft Environmental Impact Report
DSR	Draft Scoping Report
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EMPr	Environmental Management Programme
EIA	Environmental Impact Assessment
FBAR	Final Basic Assessment Report
FEIAr	Final Environmental Impact Report
Ha	Hectares
I&AP	Interested and/or Affected Party
kV	Kilovolt
MW	Megawatt
NC DENC	Northern Cape Department of Environment and Nature Conservation
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
WEF	Wind Energy Facility

OMGEWINGSIMPAKEVALUERINGS (OIE's) EN OMGEWINGSBESTUURSPROGRAMME (OBPR'e) VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAAN-LEGTE (WKA's), EN BASIESE EVALUERINGS (BE's) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

- **EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word**
- **EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word**
- **ALETTA WKA – DO Verw. No.: Moet aangekondig word**
- **EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word**
- **ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word**

INLEIDING

BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) beoog die ontwikkeling van drie (3) 140 MW Windkragaanlegte (hierna die "beoogde ontwikkeling" genoem) naby Copperton in die Siyathemba Plaaslike Munisipaliteit van die Pixley ka Seme Distriksmunisipaliteit in die Noord-Kaapprovinsie. Die beoogde ontwikkeling sal bestaan uit die 140 MW Eureka-Oos, 140 MW Eureka-Wes en 140 MW Aletta Windkragaanlegte (WKA's). Daarbenewens beoog BioTherm die oprigting van twee (2) substasies en twee (2) 132 kV kraglyne ten einde die beoogde WKA's met die nasionale kragnet te verbind. Die Eureka Substasie en 132 kV kraglyn sal gedeel word tussen die Eureka-Oos WKA en die Eureka-Wes WKA, en die Aletta Substasie en 132 kV kraglyn sal vir die Aletta WKA gebruik word. Die oorkoepelende doelwit van die projek is om elektrisiteit op te wek om by Eskom se nasionale kragnet in te voer.

Ten einde aan die Departement van Energie (DE) se mededingende bodproses vir die verkryging van hernubare krag van Onafhanklike Kragprodusente in Suid-Afrika te voldoen, sal elk van die windkrag-aanlegte onder 'n aparte Spesialedoelmedium (SDM) ontwikkel word, derhalwe vereis elke aanleg 'n aparte Omgewingsmagtiging (OM). Elk van die substasies en 132 kV kraglyne sal ook aparte OM'e vereis.

Die OIE's en BE's sal ingevolge die 2014 OIE-regulasies onderneem word wat kragtens Hoofstuk 5 van die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998) (NEMA) afgekondig is, wat op 8 Desember 2014 in werking getree het. Ingevolge hierdie regulasies sal Omgewingsimpakevaluerings (OIE's) vir die beoogde WKA's en Basiese Evaluerings (BE's) vir die gepaardgaande kraglyne benodig word. Derhalwe sal drie (3) OIE's onderneem word; een vir elk van die beoogde windkragaanlegte. Daarbenewens sal twee (2) BE's onderneem word; een vir elke substasie en 132 kV kraglyn. Hoewel elk van die WKA's en die elektriese infrastruktuur apart geevalueer sal word, word 'n enkele openbare deelnameproses vir al vyf (5) van die beoogde projekte onderneem. Die potensiële omgewingsimpakte wat met al vyf (5) projekte verband hou, sal tydens die OIE's en BE's as deel van 'n kumulatiewe impakevaluering geëvalueer word.

Alle tersaaklike wetgewing en riglyne (insluitend die Ekwatorbeginsels) sal tydens die OIE-prosesse geraadpleeg en ten alle tye aan voldoen word. BioTherm het SiVEST SA (Edms.) Bpk. (hierna SiVEST genoem) derhalwe as die onafhanklike Omgewingsevalueringspraktisyn (OEP) aangestel om die nodige OIE- en BE-proses ingevolge die NEMA te onderneem.

DOEL VAN HIERDIE DOKUMENT

Die doel van hierdie Agtergrondinligtingsdokument (AID) is om Belangstellende en/of Geaffekteerde Partye (B&GP's) in te lig oor die OIE- en BE-proses wat vir die beoogde ontwikkeling onderneem word.

Benewens die verskaffing van inligting oor die beoogde projek en die omgewingsprosesse, sal hierdie AID ook aan B&GP's die geleentheid bied om:

- die beoogde ontwikkeling beter te verstaan ten einde kommentaar te lewer en knelpunte te opper;
- die OIE- en BE-proses te verstaan ten einde doeltreffend daaraan te kan deelneem;
- voorstelle te maak om die beoogde ontwikkeling te verbeter;
- kommentaar te lewer oor die spesialisstudies wat onderneem gaan word; en
- plaaslike kennis by te dra.

AGTERGROND BETREFFENDE DIE BEOOGDE PROJEK

Ter ondersteuning van die behoefte om oplossings te vind vir die huidige elektrisiteitstekorte, die groter vraag na elektrisiteit en ook die behoefte om meer volhoubare en omgewingsvriendelike kraghulpbronne te vind, het Suid-Afrika 'n infrastruktuur-groeiprogram van stapel gestuur wat deur verskeie staatsinisiatiewe ondersteun word. In antwoord op hierdie doelwit, doen BioTherm aan die hand om drie (3) 140 MW WKA's naby Copperton in die Noord-Kaapprovinsie op te rig. Die oorhoofse doelwit van die projek is om elektrisiteit op te wek om by Eskom se nasionale kragnet in te voer aan die hand van hernubare kragtegnologieë.

WAAROM WINDKRAG GEBRUIK?

Die voordele van die gebruik van windkrag sluit die volgende in:

- WKA's beskik oor die vermoë om kommersiële krag op groot skaal te lewer;
- Windkrag is hernubaar, skoon en besoedel nie (geen kweekhuisgasse, ens.) en lewer geen neweprodukte (atmosferiese kontaminante of termiese besoedeling) op wat skadelik vir die omgewing kan wees nie;
- WKA's is oor die algemeen baie gepas vir plattelandse omgewings en derhalwe het dit 'n kleiner impak op landbou in vergelyking met ander kragopwekkingsopsies;
- WKA's kan ook bydra tot ekonomiese groei in hierdie streke;
- Windkrag is een van die goedkoopste maniere om elektrisiteit op te wek;
- Plaaslike produksie van krag verminder verliese deur transmissielyne wat gepaard gaan met die oorbring van elektrisiteit oor lang afstande; en
- WKA's verbeter Suid-Afrika se kragsekerheid, wat sodoende afhanklikheid van fossielbrandstowwe verminder.

PROJEKLIGGING

Die beoogde projek is in die Noord-Kaapprovinsie geleë. Dit van in die Siyathemba Plaaslike Munisipaliteit en die Pixley ka Seme Distriksmunisipaliteit. Die projekterreine is geïdentifiseer deur vooraf-bedryfbaarheidstudies wat BioTherm op grond van 'n beskikbare en geskikte windhulpbron, geskiktheid van 'n roosterkonneksie, kompetisie, plat topografie, beskikbaarheid van grond en terreintoegang onderneem het. Projekspesifieke liggingsbesonderhede verskyn hieronder:

Eureka-Oos WKA

Die beoogde projek is sowat 15 km noordoos van Copperton geleë en beslaan 'n oppervlak van 6 950 ha.

Die plase wat by die projek ingesluit is, is:

- die Restant van Witfontein No. 54; en
- Gedeelte 3 van Blaauwbosch Poortje No. 66.

Eureka-Wes WKA

Die beoogde projek is sowat 6 km noordoos van Copperton geleë en beslaan 'n oppervlak van 6 118 ha.

Die plase wat by die projek ingesluit is, is:

- Gedeelte 8 van Nelspoortje No. 103;
- Gedeelte 9 van Nelspoortje No. 103;
- Gedeelte 2 van Blaauwbosch Poortje No. 66; en
- die Restant van Blaauwbosch Poortje No. 66.

Aletta WKA

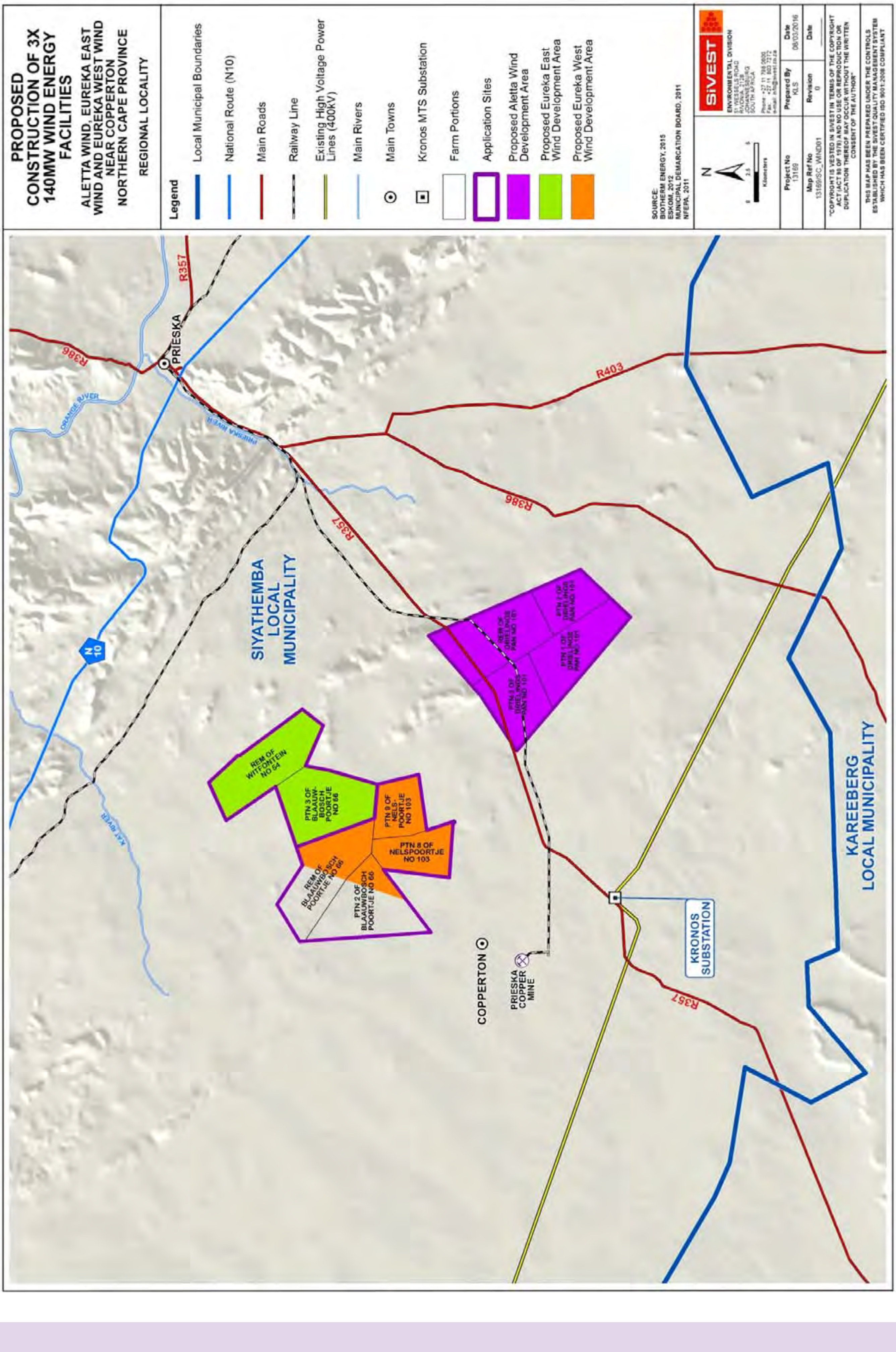
Die beoogde projek is sowat 20 km oos van Copperton geleë en beslaan 'n oppervlak van 11 002 ha.

Die plase wat by die projek ingesluit is, is:

- Gedeelte 1 van Drielings Pan No. 101;
- Gedeelte 2 van Drielings Pan No. 101;
- Gedeelte 3 van Drielings Pan No. 101; en
- die Restant van Drielings Pan No. 101.

Die aansoekterreine vir die drie (3) beoogde WKA's word aangedui op die onderstaande liggingskaart (**Figuur 1**). Die alternatiewe roetekorridors vir die gepaardgaande 132 kV kraglyne sal tydens die BE-prosesse vir elk van die kraglyne en substasies verskaf word.

Figuur 1: Liggingskaart



OIE-/BE-PROSES

Wat is 'n OIE?

'n OIE is 'n proses waardeur inligting wat tersaaklik is vir die oorweging van 'n spesifieke omgewingsaansoek versamel, saamgevoeg, ontleed, vertolk en gekommunikeer word. OIE's word deur beplanningsowerhede/ontwikkelaars gebruik om 'n onafhanklike en objektiewe beskouing van die potensiële omgewingsimpakte (biofisies en maatskaplik) te verkry wat tydens die oprigting en bedryf van die beoogde ontwikkeling kan opduik. Hierdie inligting moet die Bevoegde Owerheid 'n konkrete grondslag vir hul besluitneming bied.

Wat is 'n BE?

'n BE is dieselfde as 'n OIE, maar word onderneem waar die impakte minder waarskynlik 'n beduidende impak op die ontvangsomgewing sal hê. Net soos OIE's identifiseer BE's potensiële omgewingsimpakte en bied die Bevoegde Owerheid 'n konkrete grondslag vir hul besluitneming.

Wetlike Vereistes

Volgens NEMA, soos gewysig, moet 'n OIE-proses vir die beoogde windkragaanlegte onderneem word aangesien elk van die beoogde projekte aanleiding gee tot verskeie gelyste kennisgewing 2-aktiwiteite. 'n BE-proses moet vir die gepaardgaande kraglyne onderneem word aangesien elk van die beoogde projekte aanleiding gee tot verskeie gelyste kennisgewing 1-aktiwiteite (Staatskennisgewing R983).

Die OIE- en BE-proses wat gevolg sal word, word in Figuur 2 en Figuur 3 hieronder uiteengesit

Bevoegde Owerheid

Die DO is die Bevoegde Owerheid vir hierdie beoogde projekte. Die provinsiale owerhede (d.i. die Noord-Kaapse Departement van Omgewingsake en Natuurbewaring (NC DENC)) sal egter ook geraadpleeg word.

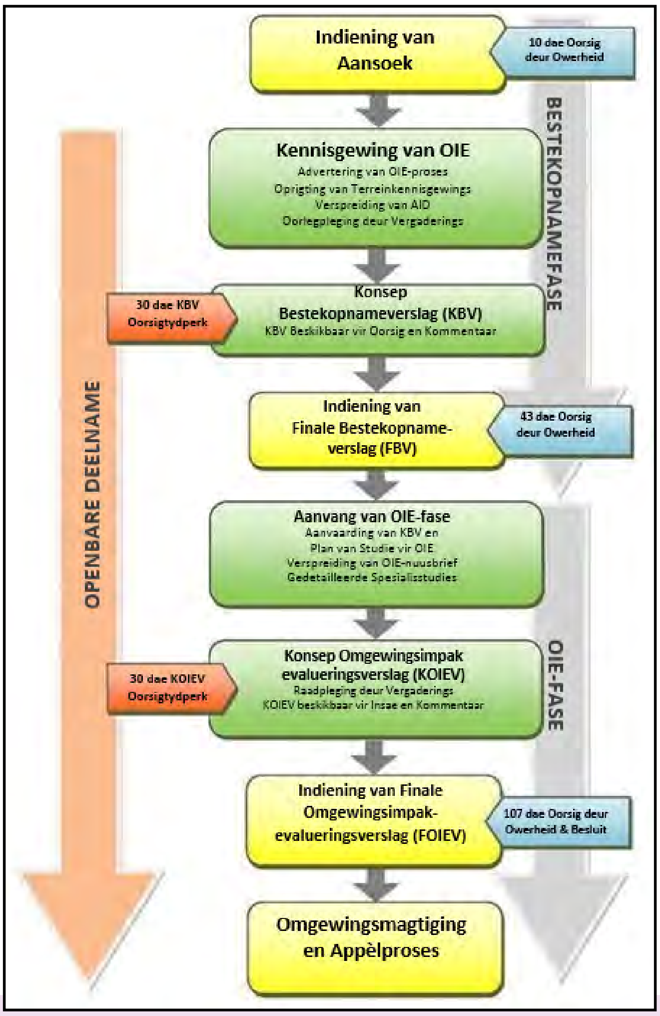
Omgewingskwessies wat tydens die OIE en BE ondersoek moet word

Verskeie omgewingsparameters is vir die beoogde ontwikkeling geïdentifiseer wat ondersoek sal verg. Dit word in **Tabel 1** hieronder gelys.

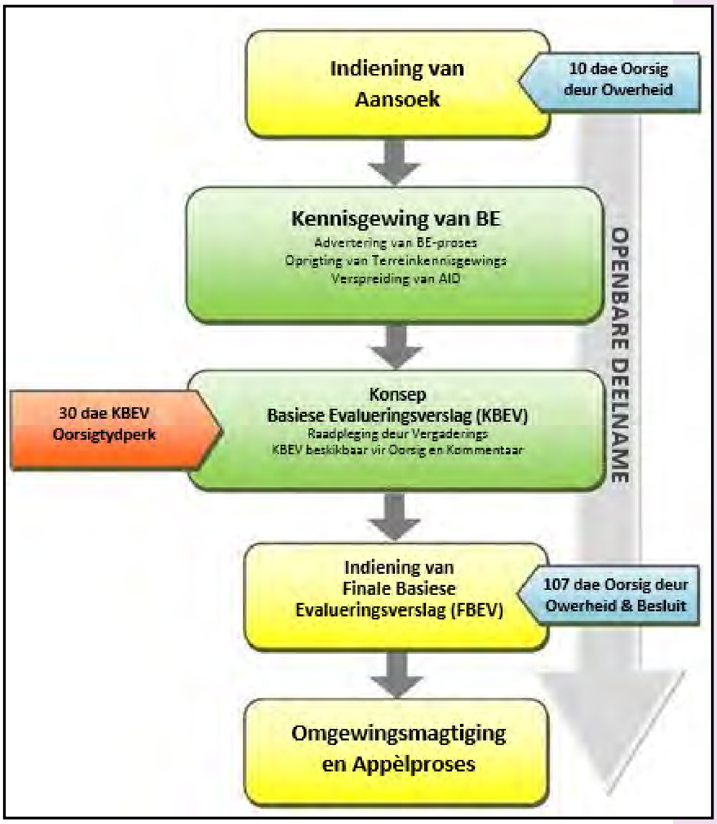
Tabel 1. Lys van spesialiste en spesialisstudies wat vir die beoogde ontwikkeling onderneem moet word

VAARDIGHEID	NAAM
Biodiversiteit	David Hoare – David Hoare Consulting
Avifauna	Chris van Rooyen – Chris van Rooyen Consulting
Vlermuise	Werner Marais – Animalia
Oppervlakwater	Shaun Taylor – SiVEST
Landboupotensiaal	D G Paterson – LNR Instituut vir Grond, Klimaat en Water
Visueel	Andrea Gibb en Stephan Jacobs – SiVEST
Geraas	Adrian Jongens – Jongens Keet Associates
Erfenis	Wouter Fourie – PGS
Sosio-ekonomies	Memory Madondo – Urban-Econ Development Economists
Openbare Deelname	Nicolene Venter – Zitholele Consulting

Figuur 2: Diagram van OIE-proses



Figuur 3: Diagram van BE-proses



DIE OPENBARE DEELNAMEPROSES

Openbare deelname is die hoeksteen van enige OIE of BE, soos ook in die geval van hierdie beoogde projekte. Die beginsels van NEMA beheer baie aspekte van OIE of BE, insluitend openbare deelname. Die hoofdoel van openbare deelname tydens hierdie OIE en BE sal wees om B&GP's te voorsien van genoegsame en tersaaklike inligting en om deursigtige oorlegplegingsproses op 'n deurlopende grondslag te onderneem ten einde doeltreffende deelname regdeur die OIE- en BE-proses te verseker. As deel van hierdie openbare deelnameproses sal u ook die geleentheid kry om kommentaar te lewer op die omgewingsbevindinge ingevolge die OIE- en BE-verslae (Bestekopname, Impakevaluering en Basiese Evaluering), wat tydens die prosesse beskikbaar gestel gaan word vir openbare insae en kommentaar.

Dit is belangrik dat tersaaklike B&GP's en Belanghebbendes uit die staanspoor van die beoogde projekte geïdentifiseer en by die openbare deelnameproses betrek word. As 'n geregistreerde B&GP sal u persoonlike kennisgewings per e-pos, pos, faks en/of sms (waar van toepassing) ontvang, wat u in kennis stel van alle dokumente wat beskikbaar is vir kommentaar, wat die kommentaartydperke is en van die vergaderings wat voorlê.

U verantwoordelikhede as 'n B&GP

Ingevolge die OIE-regulasies, word u aandag gevestig op u verantwoordelikhede as 'n B&GP, naamlik u moet:

- aan die OIE- en BE-proses deelneem en uself op die projek se databasis registreer;
- enige ander partye (bure, vriende, kollegas, ens.) wat kan belangstel in en/of deur die beoogde projekte geaffekteer word, in kennis stel van die OIE en BE-proses en hulle aanmoedig om betrokke te raak; en
- toesien dat enige kommentaar betreffende die beoogde projekte binne die afgekondigde tydsraamwerke wat aan u gekommunikeer sal word, ingedien word.

Ons verantwoordelikhede as die onafhanklike OEP

Ingevolge die OIE-regulasies, sluit ons verantwoordelikhede in die openbare deelnameproses in om toe te sien dat:

- u van voldoende inligting betreffende die beoogde projek voorsien word, hetsy deur die AID of deur inligting te verskaf soos en wanneer dit versoek word;
- u oor 'n begrip van die beoogde projek beskik ten einde ingeligte kommentaar te kan lewer en om u in staat te stel om enige knelpunt op ingeligte wyse in te dien; en
- die volgende stappe met ontvangs van enige kommentaar/navraag/kwessie geneem word:
    - ❑ Die kontakbesonderhede wat u verstrek het, sal in die projek se databasis ingevoer word;
    - ❑ alle verdere inligtingstukke sal aan u gestuur word; en
    - ❑ indien u navrae of kommentaar aan ons stuur, sal ons skriftelik (hetsy per e-pos of in die kommentaar- en antwoordverslag) daarop reageer.

Hoe om betrokke te raak

Indien u as 'n B&GP wil registreer, kan u dit doen deur:

- te reageer (telefonies, per faks, pos of e-pos) op ons uitnodiging vir u deelname, wat in die pers geadverteer is;
- die aangehegte Registrasie- en Kommentaarvorm aan SiVEST te pos, te faks of te e-pos;
- die vergaderings by te woon wat gedurende die verloop van die projek gehou sal word. Indien u as 'n B&GP registreer, sal u outomaties uitgenooi word om hierdie vergaderings by te woon;
- telefonies met ons in verbinding te tree indien u 'n navraag of kommentaar het of verdere projekinligting verlang; en
- kommentaar oor die Konsep Bestekopnameverslag (KBV) en/of die Konsep Omgewingsimpak-evalueringsverslag (KOIEV) en/of die Konsep Basiese Evalueringsverslag (KBEV) in te dien binne die oorsigtydperke wat uiteengesit sal word.

Indien u uself as 'n B&GP vir hierdie beoogde projekte ag, moedig ons u aan om gebruik te maak van die geleenthede wat deur die openbare deelnameproses geskep word om aktief by die proses betrokke te raak en kommentaar te lewer of daardie vraagstukke of knelpunte te opper wat u raak en/of waarin u belangstel of waaroor u meer inligting verlang. U inset in hierdie proses vorm 'n belangrike deel van die omgewingstudies en ons hoor graag van u om u siening oor die beoogde projek in te win.

Deur die meegaande Registrasie- en Kommentaarvorm in te vul en in te dien, registreer u uself outomaties as 'n B&GP vir hierdie beoogde projekte en verseker u dat die kommentaar en/of knelpunte wat u betreffende die beoogde projekte opper, aangeteken en aangespreek sal word. Die OEP sal reageer op alle kommentaar en navrae wat tydens die verloop van die OIE en BE ontvang word.

Neem asseblief kennis dat alle tersaaklike publieke dokumente van SiVEST se webwerf afgelaai kan word.

Ons sien uit na u bydraes

Kontak: Andrea Gibb of Lynsey Rimbault

Posbus 2921, RIVONIA, 2128

☎ Tel: 011 798 0600

E-pos: andreag@sivest.co.za of lynseyr@sivest.co.za

Faks: 011 803 7272

LYS VAN AKRONIEME

AID	Agtergrondinligtingsdokument
B&GP	Belangstellende en/of Geaffekteerde Party
BE	Basiese Evaluering
DO	Departement van Omgewingsake
FBEV	Finale Basiese Evalueringsverslag
FOIEV	Finale Omgewingsimpakevalueringsverslag
Ha	Hektaar
KBEV	Konsep Basiese Evalueringsverslag
KBV	Konsep Bestekopnameverslag
KOIEV	Konsep Omgewingsimpakevalueringsverslag
kV	Kilovolt
MW	Megawatt
NC DENC	Noord-Kaapse Departement van Omgewingsake en Natuurbewaring
NEMA	Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998)
OBPr	Omgewingsbestuursprogram
OEP	Omgewingsevalueringspraktisyn
OIE	Omgewingsimpakevaluering
OM	Omgewingsmagtiging
WKA	Windkragaanleg

SiVEST

EIAs AND EMPrs FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WEFs, AND BAs FOR THE TWO ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE **REGISTRATION AND COMMENT FORM** **Accompanying Background Information Document: 18 March 2016** BioTherm Energy	**Public Participation Office** SiVEST Andrea Gibb / Lynsey Rimbault SiVEST Environmental PO Box 2921, RIVONIA, 2128 **Tel** (011) 798 0600 **Fax** (011) 803 7272 **Email** andreag@sivest.co.za / lynseyr@sivest.co.za

Please complete and return by post, fax or e-mail to the Public Participation Office (as above)

TITLE		**FIRST NAME**	
INITIALS		**SURNAME**	
ORGANISATION		**EMAIL**	
POSTAL ADDRESS			
		POSTAL CODE	
TEL NO		**FAX NO**	

REGISTRATION AS INTERESTED AND/OR AFFECTED PARTY (I&AP) (please circle applicable box)

Please **formally register me as an Interested and Affected Party (I&AP)** so that I may receive further information and notifications during the EIA process	**YES**	**NO**
In terms of GNR 982 (2014 EIA Regulations) I disclose below any direct business, financial, personal or other interest that I may have in the granting or rejection of the application for environmental authorisation (please use separate sheets if you wish): …………………………………………………………………………………………………… ……………………………………………………………………………………………………		

COMMENTS (please use separate sheets if you wish)

I suggest that the following issues of concern be investigated in the EIA:

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

I suggest the following for the EIA process and / or the Public Participation Process:

……………………………………………………………………………………………………

……………………………………………………………………………………………………

Any other comments:

……………………………………………………………………………………………………

……………………………………………………………………………………………………

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……………………………………………………………………………………………………

Please contact the following colleagues/friends to register as I&APs for this EIA (name and contact details e.g. e-mail address):

……………………………………………………………………………………………………

……………………………………………………………………………………………………

Signature **THANK YOU FOR YOUR CONTRIBUTION** **Date**

OIE's EN OBPR'e VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WKA's, EN BE's VIR DIE TWEE GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

REGISTRASIE- EN KOMMENTAARVORM

Vergesel die Agtergrondinligtingsdokument: 18 Maart 2016

BioTherm Energy

Openbare Deelnamekantoor

SiVEST

Andrea Gibb / Lynsey Rimbault
SiVEST Environmental
Posbus 2921, RIVONIA, 2128
Tel: 011 798 0600
Faks: 011 803 7272
E-pos: andreag@sivest.co.za / lynseyr@sivest.co.za

Vul asseblief in en stuur dit per pos, faks of e-pos terug aan die Openbare Deelnamekantoor (soos hierbo).

TITEL		**VOORNAAM**	
VOORLETTERS		**VAN**	
INSTANSIE		**E-POS**	
POSADRES			
		POSKODE	
TEL NO.		**FAKS NO.**	

REGISTRASIE AS BELANGSTELLENDE EN/OF GEAFFEKTEERDE PARTY (B&GP) (omkring asseblief die toepaslike blokkie)

Registreer my asseblief formeel as 'n belangstellende en geaffekteerde party (B&GP) sodat ek verdere inligting en kennisgewings tydens die OIE-proses kan ontvang.	**JA**	**NEE**
Ingevolge Staatskennisgewing R982 (2014 OIE-Regulasies) maak ek hieronder enige regstreekse sake, finansiële, persoonlike of ander belang wat ek mag hê in die goedkeuring of afkeuring van die aansoek om omgewingsmagtiging bekend (gebruik gerus aparte bladsye indien u wil): ………………………………………… …………………………………………		

KOMMENTAAR (gebruik gerus aparte bladsye indien u wil)

Ek stel voor dat die volgende knelpunte tydens die OIE ondersoek word:

…………………………………………………………

…………………………………………………………

…………………………………………………………

Ek stel die volgende vir die OIE-proses en/of die openbare deelnameproses voor:

…………………………………………………………

…………………………………………………………

Enige ander kommentaar:

…………………………………………………………

…………………………………………………………

…………………………………………………………

…………………………………………………………

…………………………………………………………

…………………………………………………………

Tree asseblief in verbinding met my onderstaande kollegas/vriende om as B&GP's vir hierdie OIE te registreer (naam en kontakbesonderhede, bv. e-posadres):

…………………………………………………………

…………………………………………………………

Handtekening

DANKIE VIR U BYDRAE

Datum

Hlengiwe Ntuli

From: Hlengiwe Ntuli
Sent: 18 March 2016 05:15 PM
Cc: Andrea Gibb; 'nicolenev@zitholele.co.za'; Lynsey Rimbault
Subject: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process
Attachments: 13169_Eureka and Aletta_BID_Rev 1_8March2016 (Afrikaans).pdf; 13169_Eureka and Aletta_BID_Rev 1_8March2016_LR.PDF; 13169_Eureka and Aletta_ Invite Letter_Rev 1_08Mar2016 (Afrikaans).pdf; 13169_Eureka and Aletta_ Invite Letter_Rev 1_08Mar2016_RT.PDF; 13169_Eureka and Aletta_Draft BID Reg Comm Form_Rev 1_8March2016_LR AFR.PDF; 13169_Eureka and Aletta_Draft BID Reg Comm Form_Rev 1_8March2016_RT.PDF

Tracking:

Recipient	Delivery	Read
Andrea Gibb	Delivered: 2016/03/18 05:15 PM	Read: 2016/03/22 12:39 PM
'nicolenev@zitholele.co.za'		
Lynsey Rimbault	Delivered: 2016/03/18 05:15 PM	
'Frans van Wyk'		
'Amanda Bester'		
'Heleen van den Heever'		
'Dirk van Wyk'		
'Olwethu Tshikela'		
'Toni Cahi'		
'Thulani Mthombeni'		
'Evert Burger'		
'Lizell Stoh'		
'Sonwabile Nkondeshe'		
'Sonwabile Nkondeshe'		
'Seoka Lekota'		
'Simphiwe Masilela'		
'Sanda De Jager'		
'Jaco Roelofse'		
'Andrew Timothy'		
'Elizabeth Martin'		
'Patrick Lenyibi'		
'Jack Maccollan'		
'Miriam Kibi'		
'Sam Diokpala'		
'Onwabile Ndzumo'		
'Ntsundeni Ravhogoni'		
'Lorraine Nobela'		
'Nico Fourie'		
'Pieter Fourie'		
'Mmatlala Rabothata'		
'Jane Molepo'		
'William van Staden'		

Recipient	Delivery	Read
'Beatrice Mondzinger'		
'IWJ Stadhouer'		
'Piet Papier'		
'Mashudu Marubini'		
'Mashudu Mukoma'		
'Mandisa Yawa'		
'Ester Makungo'		
'Moses Mahunonyane'		
'Lourens Leeuwner'		
'Ernest Kubayi'		
'Johan Koegelenberg'		
'Johan Badenhorst'		
'Johanna Morobane'		
'Jenna Lavin'		
'Jasper Nieuwoudt'		
'Jakob Basson'		
'Jacoline Mans'		
'Suzanne Erasmus'		
'Wynand Human'		
'Danie & Jomima Bernard'		
'Alexia Hlengani'		
'Hettie Buys'		
'Hettie Morobisi'		
'Henning Myburg'		
'Gert Steenkamp'		
'Vivian Groenewald'		
'Gregory MacKay'		
'Gloria Speelman'		
'Giel MacDonald'		
'Gerhard Van Wyk'		
'John Geeringh'		
'F M Van Wyk'		
'Sam Fiff'		
'Frank Andreas'		
'Ferlicia Ward'		
'Sindisile Madyo'		
'Ertjies Taljaart'		
'Shaun Dyers'		
'Rene De Kock'		
'Bradley Gibbons'		
'Brian Fisher'		
'Betty Titus'		
'Adriaan Tiplady'		

Recipient	Delivery	Read
'Aletta De Jager'		
'Simon Gear'		
'Carolyn Ah Shene-Verdoorn'		
'Nicole Abrahams'		
'Abe Abrahams'		

******* Please note that this email was sent from a NO REPLY email address. Please do not reply to this address as it is an unmonitored email account. *******

Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

- EUREKA EAST WEF – DEA Ref No: To be announced
- EUREKA WEST WEF – DEA Ref No: To be announced
- ALETTA WEF – DEA Ref No: To be announced
- EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced
- ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced

- INVITATION TO PARTICIPATE IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of the EIA Regulations and the National Environmental Management Act, 1998 (Act No. 107 of 1998), SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) has been appointed as the independent Environmental Assessment Practitioner (EAP) by BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) to conduct the EIA processes for the proposed development of the Eureka East, Eureka West and Aletta 140MW WEFs, and the BA processes for the two (2) associated substations and 132kV power lines. The proposed projects are located in the Northern Cape Province near Copperton.

SiVEST would like to invite you, as a potential Interested and/or Affected Party (I&AP), to become actively involved in the EIA and Public Participation Process (PPP) for this proposed project. The aim of this process is as follows:

- to ensure that all the relevant environmental impacts are taken into consideration;
- to ensure public input; and
- provide decision-makers with sufficient information to make an informed decision on the proposed activities.

Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.
****

Geagte Belangstellende en/of Geaffekteerde Party

OMGEWINGSIMPAKEVALUERINGS (OIE's) EN OMGEWINGSBESTUURSPROGRAMME (OBPR'e) VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA's), EN BASIESE EVALUERINGS (BE's) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

- EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word
- EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word
- ALETTA WKA – DO Verw. No.: Moet aangekondig word
- EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word
- ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word

- UITNODIGING OM DEELNAME AAN DIE OMGEWINGSIMPAKEVALUERINGSPROSES

Ingevolge die OIE-regulasies en die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998), is SiVEST SA (Edms.) Bpk. (hierna SiVEST genoem) deur BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) aangestel as die onafhanklike Omgewingsevalueringspraktisyn (OEP) ten einde die OIE-prosesse vir die beoogde ontwikkeling van die Eureka-Oos, Eureka-Wes en Aletta 140 MW WKA's en die BE-prosesse vir die twee (2) gepaardgaande substasies en 132 kV kraglyne te onderneem. Die beoogde projekte is naby Copperton in die Noord-Kaapprovinsie geleë.

SiVEST nooi u, as 'n potensiële Belangstellende en/of Geaffekteerde Party (B&GP), om aktief by die OIE en Openbare Deelnameproses (ODP) vir hierdie beoogde projek betrokke te raak.

Die doel van hierdie proses is om:
- toe te sien dat al die tersaaklike omgewingsimpakte in ag geneem word;
- openbare insette te verseker; en
- besluitnemers van voldoende inligting te voorsien ten einde 'n ingeligte besluit oor die beoogde aktiwiteite te neem.

Aangeheg is die Agtergrondinligtingsdokument (AID) wat inligting rakende die beoogde projek, asook die beoogde OIE BE en ODP bevat.

Deur die meegaande registrasie- en kommentaarvorm in te vul en in te dien, sal u as 'n B&GP op die projek se databasis geregistreer word.

Ons bedank u by voorbaat dat u deel word van die Openbare Deelnameproses en ons sien daarna uit om u waardevolle insette betreffende die beoogde projek te ontvang.

Die uwe

Andrea Gibb (B.Sc. Landscape Architecture; B.Sc.(Hons) Environmental Management) Environmental Practitioner and Visual Specialist SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

Direct +27 11 798 0638 Tel +27 11 798 0600 fax +27 11 803 7272 cell +27 72 587 6525 email andreag@sivest.co.za website www.sivest.co.za

Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

Appendix 7C
Proof of Advertisements

SiVEST
Environmental Division

SiVEST
Established in 1952

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY (WEF), AND BASIC ASSESSMENT (BA) FOR THE ASSOCIATED SUBSTATION AND 132kV POWER LINE NEAR COPPERTON, NORTHERN CAPE PROVINCE

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as amended and the Environmental Impact Assessment (EIA) Regulations, under Government Notices No R982, R983, R984 and R985 promulgated on 4 December 2014, notice is hereby given that BioTherm Energy (Pty) Ltd has appointed SiVEST SA (Pty) Ltd, as the independent environmental assessment practitioner (EAP), to undertake the required Environmental Impact Assessment (EIA), Basic Assessment (BA) and public participation process for the above-mentioned proposed projects:

PROJECT DESCRIPTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) are proposing to develop the Aletta 140MW Wind Energy Facility (WEF) near Copperton within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality in the Northern Cape Province. In addition, BioTherm are proposing to construct a substation and a 132kV power line in order to connect the proposed WEF to the national grid. The overall objective of the projects is to generate electricity to feed into the national Eskom grid.

The EIA and BA will be conducted in terms of the EIA Regulations 2014 promulgated in terms of Chapter 5 of the NEMA, which came into effect on the 8th of December 2014. In terms of the EIA Regulations 2014, an EIA will be required for the proposed WEF and a BA will be required for the associated power line. Although the WEF and the electrical infrastructure will be assessed separately, a single public participation process is being undertaken for the proposed projects. The potential environmental impacts associated with the projects will be assessed during the EIA and BA as part of a cumulative impact assessment.

PROJECT LOCATION

The proposed projects are located within the Northern Cape Province. They fall within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality. The project sites have been identified through pre-feasibility studies conducted by BioTherm based on availability of suitable wind resource, grid connection suitability, competition, flat topography, land availability and site access. The proposed projects are located approximately 20km east of Copperton. The WEF project includes the following farms:

- Portion 1 of Drielings Pan No.101
- Portion 2 of Drielings Pan No.101
- Portion 3 of Drielings Pan No.101
- Remainder of Drielings Pan No.101

AVAILABILITY OF THE DRAFT SCOPING REPORT FOR PUBLIC REVIEW

The Draft Scoping Report (DSR) for the WEF will be available for public comment and review as from Thursday 30 June 2016 to Monday 01 August 2016 (end of business day). Should you wish to receive an electronic copy of the DSR (CD) please forward your request in writing to us. Hard copies of the DSR can be reviewed at the following public place:

VENUE	STREET ADDRESS	HOURS	CONTACT NO
Elizabeth Vermeulen Public Library	Corner Victoria Street and Steward Street, Prieska	Mondays- Fridays 08h45 – 16h15 Saturday 08h00 – 13h00	053 353 5300/ 053 353 5305

The reports are also available on SiVEST's website: http://www.sivest.co.za/, click on '*Downloads*' then browse to the folder '*13169 Aletta Wind Farm'.*

To register as an Interested and / or Affected Party (I&AP) and / or to obtain additional information please submit your name, contact details and the interest which you have in the application within 30 days from the date of this notice. Please direct enquiries, **in writing,** to the Environmental Consultants below:

Andrea Gibb or **Lynsey Rimbault**

SiVEST Environmental
P O Box 2921
RIVONIA
2128

Tel: (011) 798 0600
Fax: (011) 803 7272
E-mail: andreag@sivest.co.za or lynseyr@sivest.co.za
Website: www.sivest.co.za

SiVEST
Omgewingsafdeling

SiVEST
Gestig in 1952

OMGEWINGSIMPAKEVALUERING (OIE) EN OMGEWINGSBESTUURSPROGRAMME (OBP) VIR DIE BEOOGDE ONTWIKKELING VAN DIE ALETTA 140 MW WINDKRAGAANLEG (WKA), EN BASIESE EVALUERING (BE) VIR DIE GEPAARDGAANDE SUBSTASIE EN 132 KV KRAGLYN NABY COPPERTON, NOORD-KAAPPROVINSIE

Ingevolge die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998) (NEMA), soos gewysig, en die Regulasies op Omgewingsimpakevaluerings (OIE-regulasies) ingevolge Staatskennisgewing R982, R983, R984 en R985 (gepubliseer op 4 Desember 2014) geskied kennis hiermee dat BioTherm Energy (Edms.) Bpk. SiVEST SA (Edms.) Bpk. aangestel het as die onafhanklike omgewingsevalueringspraktisyn (OEP) ten einde die nodige omgewingsimpakevaluering (OIE), Basiese Evaluering (BE) en openbare deelnameproses vir die bogenoemde voorgestelde projekte te onderneem:

PROJEKBESKRYWING

BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) beoog die ontwikkeling van die Aletta 140 MW Windkragaanleg (WKA) naby Copperton in die Siyathemba Plaaslike Munisipaliteit van die Pixley ka Seme Distriksmunisipaliteit in die Noord-Kaapprovinsie. Daarbenewens beoog BioTherm die oprigting van ’n substasie en ’n 132kV kraglyn ten einde die beoogde WKA met die nasionale kragnetwerk te verbind. Die oorkoepelende doelwit van die projekte is om elektrisiteit op te wek en by Eskom se nasionale kragnetwerk in te voer.

Die OIE en BE sal ingevolge die OIE-regulasies 2014 onderneem word wat kragtens Hoofstuk 5 van die NEMA wat op 8 Desember 2014 in werking getree het. Ingevolge die OIE Regulasies 2014 sal ‘n OIE vir die beoogde WKA en ‘n BE vir die gepaardgaande kraglyn benodig word. Hoewel die WKA en die elektriese infrastruktuur apart geëvalueer sal word, word ’n enkele openbare deelnameproses vir die beoogde projekte onderneem. Die potensiële omgewingsimpakte wat met die projekte verband hou, sal tydens die OIE en BE as deel van ’n kumulatiewe impakevaluering geëvalueer word.

PROJEKLIGGING

Die beoogde projekte is in die Noord-Kaapprovinsie geleë en val binne die Siyathemba Plaaslike Munisipaliteit en die Pixley ka Seme Distriksmunisipaliteit. Die projekterreine is geïdentifiseer deur vooraf-bedryfbaarheidstudies wat BioTherm op grond van beskikbare en geskikte windhulpbron, geskikte netwerkkonneksie, kompetisie, plat topografie, beskikbaarheid van grond en terreintoegang onderneem het. Die beoogde projekte is sowat 20 km oos van Copperton geleë. Die plase wat by die WKA projek ingesluit is, is:

- Gedeelte 1 van Drielings Pan No. 101;
- Gedeelte 2 van Drielings Pan No. 101;
- Gedeelte 3 van Drielings Pan No. 101; en
- die Restant van Drielings Pan No. 101.

UITNODIGING OM KOMENTAAR TE LEWER OP DIE KONSEP BESTEKOPNAMEVERSLAG

Die Konsep Bestekopnameverslag vir die WKA sal beskikbaar wees vir openbare kommentaar en oorsig vanaf Donderdag 30 Junie 2016 tot Maandag 1 Augustus 2016 (teen sluitingstyd). Indien u’n elektroniese kopie van die Konsep Bestekopnameverslag op CD verlang, kan u u skriftelike versoek aan ons rig (kontakinligting hiernaas). Gedrukte eksemplare van die Konsep Bestekopnameverslag sal ook by die volgende openbare plek beskikbaar wees vir besigtiging:

PLEK	STRAATADRES	KANTOOR URE	KONTAKNO.
Elizabeth Vermeulen Openbare Biblioteek	Hoek van Victoriastraat en Stewardstraat, Prieska	Maandae - Vrydae 08h45 – 16h15 Saterdag 08h00 – 13h00	053 353 5300/ 053 353 5305

Die Verslae is ook op SiVEST se webtuiste beskikbaar: http://www.sivest.co.za/, klik op ‘*Downloads’* dan klik op die legger ‘*13169 Aletta Wind Farm’.*

Ten einde as ’n Belangstellende en/of Geaffekteerde Party (B&GP) te registreer en/of om meer inligting te bekom, moet u asseblief u naam, kontakbesonderhede en die belang wat u by die aansoek het binne 30 dae vanaf die datum van hierdie kennisgewing indien. Rig asseblief u **skriftelike** navrae aan die Omgewingskonsultante hieronder:

Andrea Gibb of **Lynsey Rimbault**
SiVEST Environmental
Posbus 2921 Tel: 011 798 0600
RIVONIA Faks: 011 803 7272
2128 E-pos: andreag@sivest.co.za of lynseyr@sivest.co.za
Webwerf:www.sivest.co.za

Appendix 7D

Correspondence

17 Baker Street
Rosebank
Johannesburg
South Africa
2196

Tel: +27 (0) 11 442 2434
Fax: +27 (0) 11 442 2454
Email: atiplady@ska.ac.za

SKA SOUTH AFRICA
SQUARE KILOMETRE ARRAY

Michael Barnes
Senior Associate
BioTherm Energy (Pty) Ltd
Building 1
Design Quarter
Fourways
2067

E-mail: mbarnes@biothermenergy.com

Date: 18 March 2016

Dear Michael,

RE: DEVELOPMENT OF ALETTA WIND ENERGY FACILITY

This letter is in response to your email request, to provide comment on the potential development of Aletta wind electricity generation facility and the risk it may pose on the Square Kilometre Array Project.

The topographical analyses report compiled by MESA Solutions (April 2015) and the path loss and risk assessment report compiled By ITC (February 2016) were provided by BioTherm Energy for the purpose of evaluating the risk the proposed wind farm would have on the SKA radio telescopes. Upon detailed review of the reports provided to the SKA SA Project office, the following was concluded:

I. Both reports indicated that significant amount of mitigation would be required;

II. Given the calculated path loss between the proposed facility and the nearest SKA station, a requirement on the emissions of the wind facility is specified at between 10dB and 20dB below CISPR-22 Class B emission limits. However, such a threshold is a specified requirement, but does not give any indication of the required mitigation to reach this level;

III. The extent of the required mitigation is not fully established. However, previous measurements on similar types of facilities, the cumulative impact of multiple turbines as well as other multiple facilities in the area, suggests that in order to meet the required threshold levels, extensive and detailed mitigation would be required. There is no guarantee that the required level of mitigation would be technically possible;

IV. Based on the above, this facility remains a high risk to the SKA. Detailed emission measurements and EMC control plans, which provide sufficient evidence and proof of the determined mitigation required and that it is technically achievable, would warrant a review of this risk rating;

Given the current risk and information available, the South Africa SKA Project Office does not support the development of this wind energy facility.

This technical advice is provided by the South African SKA Project Office on the basis of the protection requirements of the SKA in South Africa, and does not constitute legal approval of the renewable energy projects in terms of the Astronomy Geographic Advantage Act, the Management Authority, and its regulations or declarations.

Regards,

Dr. Adrian Tiplady
Head of Strategy
SKA South Africa
Tel: 011 442 2434
Fax: 011 442 2454
atiplady@ska.ac.za

Lynsey Rimbault

From: Hlengiwe Ntuli
Sent: 22 March 2016 10:25
To: Lynsey Rimbault; Rebecca Thomas
Cc: Andrea Gibb
Subject: FW: EIA in Eureka & Aletta near Copperton

FYA

Kind Regards,

Hlengiwe Ntuli
Projects Secretary
SiVEST Environmental & Civils Divisions

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email HlengiweN@sivest.co.za **website** www.sivest.co.za

Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

From: Simphiwe Masilela [mailto:SimphiweM@atns.co.za]
Sent: 22 March 2016 10:16 AM
To: Hlengiwe Ntuli <HlengiweN@sivest.co.za>
Subject: RE: EIA in Eureka & Aletta near Copperton

Good day Hlengiwe,
My department is responsible for all 3rd party evaluations.
Please provide the following:

- WGS84 Coordinates
- The number of the Wind Turbines
- The Height AGL
- The Ground Elevation for each Wind Turbine AMSL
- The Diameter of the Wind Turbine

Kind Regards,

From: Hlengiwe Ntuli [mailto:HlengiweN@sivest.co.za]
Sent: Wednesday, March 16, 2016 9:26 AM
To: Simphiwe Masilela
Subject: EIA in Eureka & Aletta near Copperton

Good Day Simphiwe,

Could you kindly let me know who would be responsible for Wind Energy Facilities in the Northern Cape Province near Copperton.

I've attached a background information document for more information.

If you could kindly let me know who I can forward this to it would be greatly appreciated.

Kind Regards,

Hlengiwe Ntuli
Projects Secretary
SiVEST Environmental & Civils Divisions

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Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

BirdLife South Africa / Endangered Wildlife Trust

best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa

Compiled by:

A.R. Jenkins[1], C.S. van Rooyen[2], J.J. Smallie[3], J.A. Harrison[4], M. Diamond[5] & H.A. Smit[6]

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[6]*Conservation Manager, BirdLife South Africa (conservation@birdlife.org.za)*

Reviewed by: Professor Peter Ryan[1] and Dr Rowena Langston[2]

[1]*Associate Professor, Percy FitzPatrick Institute of African Ornithology, University of Cape Town (Peter.Ryan@uct.ac.za)*

[2]*Principal Conservation Scientist, Conservation Science Department, Royal Society for the Protection of Birds (Rowena.Langston@rspb.org.uk)*

Table of Contents

Executive summary

1. The wind energy industry is poised for rapid expansion into many areas of southern Africa. While experiences in other parts of the world suggest that this industry may be detrimental to birds (through the destruction of habitat, the displacement of populations from preferred habitat, and collision mortality with wind turbines, guyed masts and power lines), these effects are highly site- and taxon-specific in operation. Raptors, large terrestrial species and wetland birds are thought to be most susceptible, and areas of higher topographic relief are often implicated in negative impact scenarios.
2. In order to fully understand and successfully mitigate the possible impacts of wind farms on the region's birds (and to bring the local situation into line with international best practice in this field), it is essential that objective, structured and scientific monitoring of both resident and passing avifauna be initiated as soon as possible at all proposed development sites.
3. The Birds & Wind Energy Specialist Group, convened by the Wildlife & Energy Programme of the Endangered Wildlife Trust, and BirdLife South Africa, proposes the following guidelines and monitoring protocols for evaluating wind energy development proposals, including a 3-4 tier assessment process: (i) Reconnaissance – a brief site visit informs a desk-top assessment of likely avifauna and possible impacts, and the design of a site-specific survey and monitoring project, (ii) Baseline monitoring (EIA) – a full assessment of the significance of likely impacts and available mitigation options, based on the results of systematic and quantified monitoring as specified at scoping, (iii) Post-construction monitoring – duplication of the baseline work, but including the collection of mortality data, to develop a complete before:after picture of impacts, and refine the mitigation effort, and (iv) if warranted, more detailed and intensive research on affected threatened species.
4. To streamline this approach, a shortlist of priority species (threatened or rare birds, in particular those unique to the region, and especially those which are possibly susceptible to wind energy impacts and which occur in the given development area at relatively high densities) should be drawn up at the scoping stage, and these should be the primary (but not necessarily the sole) focus of all subsequent monitoring and assessment.
5. Similarly, the amount of monitoring effort required at each site should be set in terms of the anticipated sensitivity of the local avifauna and the prevalence of contributing environmental conditions (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites, and topographic complexity).
6. On-site work must be coupled with the collection of directly comparable data at a nearby, closely matched control or reference site. This will provide much needed context for the analysis of pre- *vs* post-construction monitoring data.
7. In some situations, where proposed wind energy developments are likely to impinge on flyways used by relatively large numbers of threatened and impact sensitive birds, and particularly where these movements are likely to take place at night or in conditions of poor visibility (e.g. the Cape Columbine Peninsula), it may be necessary to use radar to gather sufficient information on flight paths to fully evaluate the development proposal and inform mitigation requirements.
8. Baseline monitoring will require periodic visits to both the development and reference sites, sufficient in frequency to adequately sample all major variations in environmental conditions (with no fewer than four visits), and spanning a total study period of not less than 12 months. Variables measured/mapped on each site visit should include (i) density estimates for small terrestrial birds (in most cases not

priority species, but potentially affected on a landscape scale by multiple developments in one area), (ii) absolute counts, density estimates or abundance indices for large terrestrial birds and raptors, (iii) passage rates of birds flying through the proposed development area, (iv) occupancy/numbers/breeding success at any focal raptor sites, (v) bird numbers at any focal wetlands, and (vi) full details of any incidental sightings of priority species.

9. Post-construction monitoring should effectively duplicate the baseline work, with the addition of surveys for collision and electrocution victims under the turbines and ancillary power infrastructure.

10. While analysis and reporting on an individual development basis will be the responsibility of the relevant avifaunal specialist, all data emanating from the above process should also be housed centrally by the Birds & Wind Energy Specialist Group to facilitate the assessment of results on a multi-project, landscape and national scale.

11. These guidelines will be revised periodically as required, based on experience gained in implementing them, and ongoing input from various sectors.

12. A list of qualified avian specialists currently doing impact assessment and monitoring work at proposed wind energy sites in terms of these guidelines is available at www.birdlife.org.za and www.ewt.org.za.

Foreword 1

The Wind Energy Industry and the Best Practice Monitoring Guidelines

The South African Wind Energy Association (SAWEA) has been involved as a stakeholder in the 2012 revision of the Best Practice Guidelines for Avian Impact Assessment at proposed wind farm sites in South Africa. SAWEA supports the development of a best practice guideline which is in line with international best practice, and reiterates the importance of a guideline which is practical and pragmatic.

The present guidelines were designed with the specific objective of protecting South Africa's bird species from negative impacts associated with wind farm developments, specifically those which are conservation concern and/or those which may be sensitive to the potential impacts of wind energy facilities. In order for the South African wind energy industry as a whole, and each individual project, to be developed in a sustainable manner it is important that this objective is met.

The establishment of a sustainable and environmentally sensitive wind energy industry in South Africa will only be achieved through responsible and careful development. Due care needs to be employed to reduce the risk of negative impacts on important bird species and communities. The early implementation of a robust bird monitoring programme in line with the requirements set out in these guidelines will not only highlight potential impacts on birds, but will also inform developers of the potential risks to the project and may, in some cases, provide information to suggest that a proposed project is highly sensitive and poses a significant development risk. In many cases where some risk is identified this may be effectively mitigated through the adjustment of the development design to remove, reduce or avoid impacts on birds. Early-stage risk identification and impact mitigation can only be effective if suitable and sufficient scientific data has been collected to inform the project development process.

SAWEA supports the implementation of these guidelines on all proposed wind energy developments.

Duncan Ayling, Environmental spokesperson, South African Wind Energy Association

Foreword 2

BirdLife South Africa and the Best Practice Monitoring Guidelines

Our country needs to reduce its dependence on non-renewable means of energy generation. Harnessing the wind's energy is an obvious and attractive option, but this technology is not without environmental impacts. These include aesthetic and noise impacts, habitat loss, and collision mortality and displacement of bats and birds.

Given the recent spate of wind energy development applications in South Africa, BirdLife South Africa (BLSA) is justifiably concerned about the potential impacts of wind farms on our birds. However, we believe that by intelligent application of the lessons learned by our colleagues in other parts of the world, and by working openly with the relevant stakeholders, we can substantially reduce these negative effects. We have obtained advice and assistance from our partners in European countries where wind energy development is already quite advanced. We have also collaborated with the Wildlife and Energy Programme of the Endangered Wildlife Trust (EWT-WEP), and engaged directly with local developers, environmental assessment practitioners and specialist ornithologists alike in our efforts to address this looming problem.

Bird collision data from a handful of European and American sites demonstrate clearly that wind farms can adversely affect bird populations if they are built in the wrong places, and that effective mitigation of such impacts is mainly about understanding bird movements through the affected area, and the corresponding placement of turbines in the landscape. With this in mind, our efforts to influence the national roll-out of wind energy have focused on the critical, early stages of the impact assessment process. By drafting and disseminating two critical documents - the Birds and Wind Energy Sensitivity Map, and the Pre- and Post-construction Monitoring Guidelines (this document), BLSA/EWT-WEP have helped to sensitise both industry and government to the considerable avian issues at stake. We believe that if all stakeholders adhere strictly to these guidelines (which are in full compliance with the minimum standards of international best practice), government will issue the right authorisations for wind energy development, developers will apply appropriate and effective mitigation, and impacts on birds to will be limited to acceptable and sustainable levels.

BirdLife South Africa sincerely appreciates the inputs of the experts on the Birds and Wind Energy Specialist Group, and congratulates the authors of this report for producing a thorough and practical document, which will contribute greatly to the conservation of our country's birds.

Mark Anderson, CEO BirdLife South Africa

Foreword 3

The Endangered Wildlife Trust and the Best Practice Monitoring Guidelines

The Endangered Wildlife Trust (EWT) has been pioneering Conservation in Action since 1973. In this time, the EWT has been at the forefront of developing innovative, strategic partnerships with various industries to generate proactive mitigation measures to reduce harmful impacts on our environment, and to catalyse management practices throughout the sector which reduce wildlife losses.

With the recent emergence of wind generated power as a key element in our future energy mix, we have the perfect opportunity to get ahead of the game, and to apply best practice proactively in the development of wind farms and their associated infrastructure. Unfortunately, the emergence of this possible new threat to our avifauna comes at a time when birds globally are declining in conservation status and where South Africa has among the highest number of birds at risk of extinction in Africa. There is therefore no time to lose in ensuring that wind farm development in South Africa poses as little threat as possible to our birds and to the environment at large.

In this context, the EWT is proud to be working with long-standing partner BirdLife South Africa and a range of new collaborators in the wind energy sector to develop these best practice guidelines, which aim to ensure that the development of wind energy infrastructure takes place sustainably, and without detrimentally affecting the region's birds.

Yolan Friedmann, CEO Endangered Wildlife Trust

Foreword 4

Eskom and the Best Practice Monitoring Guidelines

As a state-owned company (SOC), Eskom supports South Africa's commitment to the three objectives of the Convention of Biological Diversity's Strategic Plan, namely; "the conservation of biological diversity, the use of the components of biological diversity in a sustainable manner, and the fair and equitable sharing of the benefits of biological diversity". Due to the nature and extent of our operations, Eskom can have an impact on wildlife, and on birds in particular. We work hard to manage and minimise this impact while still supplying power to the country, and in doing so we promote the conservation of southern Africa's biodiversity, and demonstrate our commitment to the national biodiversity strategy. Avian interactions are one of the key high-level indicators that Eskom uses to measure its impact on biodiversity.

We whole-heartedly endorse the BLSA/EWT best practice guidelines for monitoring birds and bird impacts at wind energy sites, and believe that adoption and implementation of these protocols in the roll-out of the wind energy industry in our country will be instrumental in substantially reducing the impact of wind farms on our avifauna.

Dr S.J. Lennon, Group Executive, Sustainability Division, Eskom Holdings SOC Ltd

1. Introduction

The wind energy industry is in the process of rapid expansion in southern Africa (and more broadly on the continent, as well as globally – World Wind Energy Association 2010). A short-list of credible, scientific studies done or ongoing in other parts of the world (Drewitt & Langston 2006, 2008 and references therein, Jordan & Smallie 2010) have established that the most prevalent impacts of wind energy facilities (WEFs) on birds are displacement of sensitive species from development areas, and mortality of susceptible species, primarily in collisions with development hardware. However, the nature and extent of these impacts is highly dependent on both site- and species-specific variables (Drewitt & Langston 2006, 2008 and references therein, Jordan & Smallie 2010), and there is no empirically based understanding of the likely effects of wind energy development on southern African birds. The South African Birds & Wind Energy Specialist Group (BAWESG) therefore recognizes the need to measure these effects as quickly as possible, in order to identify and mitigate any detrimental impacts on threatened or potentially threatened species. BAWESG also recognizes the need to gather these data in a structured, methodical and scientific manner, in order to arrive at tested and defensible answers to critical questions (Stewart *et al.* 2007).

This should be done by means of an integrated programme of pre- and post-construction monitoring projects, set up at all the proposed development sites. Each such project should broadly comply with the guidelines provided here, although the scale of each project, the level of detail and technical input, and the relative emphasis on each survey and monitoring component, will vary from site to site in terms of the risk potential identified by the initial scoping or environmental impact assessment (EIA) studies. In principle, each project should be as inclusive and extensive (both spatially and temporally) as possible, but kept within reasonable cost constraints, consistent with the anticipated conservation significance of the site and its avifauna. While the need to be more prescriptive on the required minimum standards for monitoring is recognized, the data to empirically test and support such standards are not yet available. In general, the detail and rigor required in any given monitoring project will be proportional to the size of the proposed WEF (*n* turbines and spatial extent), topographic and/or habitat heterogeneity on site, the relative importance of the local avifauna (in terms of diversity, abundance and threat status), and the anticipated susceptibility of these birds to the potential negative impacts of a wind energy development (Table 1).

In this context, a three to four tier system of survey and monitoring, which has been applied in both Europe and North America (e.g. Scottish Natural Heritage 2005, Kuvlevsky *et al.* 2007), is probably a good approach to use here. The current South African EIA process provides the first tier product in such a system in the form of what is presently considered as a full specialist impact assessment report, but which is actually no more than a reconnaissance or scoping study. Should this initial scoping report endorse the development, a full avian impact assessment (AIA) should then be based on the second tier of work, comprising baseline survey and monitoring. Should the AIA also endorse the proposed development and it goes ahead, a third tier of work would consist of a comparative post-construction survey and monitoring effort. Note that while the more general development impacts associated with the actual construction of each wind energy facility are not a primary focus of this document, BAWESG acknowledges that these may be severe. The scale and mitigation of these impacts should be referred to explicitly in scoping level and AIA reports, should be integral to the ultimate Record of Decision (RoD), and should be monitored and mitigated under the development construction management plan.

In each instance, pre- and post-construction monitoring should be undertaken at a minimum of one nearby reference site, matched as closely as possible to the proposed development site, to validate before:after comparisons of bird populations and movements. Lastly, at selected sites where bird impacts are expected to be particularly direct and severe (in terms of the relative biodiversity value of the affected avifauna, and/or the inherent risk potential of the proposed facility), additional, more customized and experimental research initiatives may be required, such as intensive, long-term monitoring of marked or even satellite tagged populations (e.g. Nygård *et al.* 2010).

The overarching aims of this multi-tiered approach would be:

(i) To develop our understanding of the effects of WEFs on southern African birds.
(ii) To develop the most effective means to mitigate these impacts.

Given the rate and extent of proposed wind energy development, this should be done as quickly as possible, but using scientific methods to generate accurate, comparable information. The current set of best practice guidelines presents the means and standards required to achieve these aims. This is intended to be a living document that will be corrected, updated, and supplemented over time, as local specialist and research practitioners gain much-needed experience in this field. A similarly dynamic list of qualified avian specialists currently doing impact assessment and monitoring work at proposed wind energy sites in terms of these guidelines is available at www.birdlife.org.za and www.ewt.org.za.

2. Recommended protocols

Time, human capacity and finances are all legitimate constraints on the extent and intensity of monitoring work possible, but cannot at any stage be allowed to override the need to maintain the levels of coverage required to thoroughly evaluate the sustainability of a proposed WEF. Bird density and activity monitoring should focus data collection on a shortlist of priority species, defined in terms of (i) threat status or rarity, (ii) uniqueness or endemism, (iii) susceptibility to disturbance or collision impacts, and (iv) relative abundance on site. These species should be identified in the scoping/AIA report and/or by the BAWESG sensitivity mapping exercise. This will generally result in a strong emphasis on large, red-listed species (e.g. cranes, bustards and raptors – Drewitt & Langston 2006, 2008, Jenkins *et al*. 2010).

Factors which might motivate for intensified monitoring effort include high densities or diversity of threatened and/or endemic species, or the proximity of known and important avian flyways or wetlands, all of which add substantially to the potential impact of a given development (Table 1). Conversely, the absence of such factors would indicate reduced survey and monitoring requirements, although the interplay of these variables is likely to be complex and site-specific. Current levels of understanding preclude the establishment of any broadly applicable rules on monitoring intensity at this stage (Table 1).

Table 1. *Qualitative grading of required bird monitoring effort at proposed WEF sites in relation to a sample suite of potentially relevant parameters. Note that the inter-play between these and other contributing factors at each facility is likely to be complex and highly site specific, and is not represented in this table. The quantity of monitoring required in each case should ultimately be determined by the on-site specialist, with input from the Birds & Wind Energy Specialist Group if and when required.*

Required survey effort	**Size of proposed WEF**	**Topography**	**Threatened species**	**Flyways**	**Importance for priority species**	**Proximity of significant wetlands**
Lower	<20 turbines	Flat	No red-listed endemics and only few red-listed species are present	Site does not impinge on a known avian flyway	No priority species breeding or roosting communally within the affected area	No regionally or nationally significant wetlands within the affected area
Medium	20-100 turbines	Undulating	At least one red-listed endemic and some red-listed species are present	No information available on avian flyways in the area	One priority species breeding or roosting communally within the affected area	One regionally or nationally significant wetland within the affected area
Higher	>100 turbines	Hilly with prominent and defined ridges	Multiple red-listed endemics and many red-listed species are present	Site impinges on a known avian flyway	>1 priority species breeding or roosting communally within the affected area	>1 regionally or nationally significant wetland within the affected area

While immediate conservation imperatives and practical constraints motivate for focus on priority species, it is also important to account for more subtle, systemic effects of wind energy developments, which may be magnified over very large facilities, or by multiple facilities in the same area. For example, widespread, selective displacement of smaller, more common species by WEFs may ultimately be detrimental to the status of these birds and, perhaps more significantly, may upset the balance and effective functioning of the local ecosystem. Similarly, the loss of relatively common but ecologically pivotal species (e.g. non-threatened apex predators such as Verreaux's Eagle *Aquila verreauxii*) from the vicinity of a WEF may also have a substantial, knock-on effect. Hence, some level of monitoring of small bird populations will be required at all sites, and certain non-threatened but impact susceptible species will emerge as priority species by virtue of their perceived value to the ecosystem. Also note that quantitative surveys of small bird populations may be the only way in which to adequately test for impact phenomena such as displacement (Devereaux *et al.* 2008, Farfán *et al.* 2009), given that large target species occur so sparsely in the environment that it may not be possible to submit density or abundance estimates to rigorous statistical examination.

Ultimately, each monitoring project should provide much needed quantitative information on the numbers, distributions and risk profiles of key species or groups of species within the local avifauna at a given development site, and serve to inform and improve mitigation measures designed to reduce this risk. The bulk of the work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced specialist ornithologist.

2.1 Stage 1: Reconnaissance

This stage should comprise most of what is currently considered as the EIA stage of the development application process. Local specialists, consulting agencies, developers and (most importantly) the SA Department of Environmental Affairs (DEA) will be required to change their perspectives on the EIA process in order to successfully institute this change, with the full AIA assessment then being compiled in terms of the outcomes of baseline monitoring.

The main aims of a reconnaissance study are:

(i) To define the study area - the core of the area covered by survey and monitoring work done at each proposed development site is determined by the client, and comprises the inclusive area on which development activities (the construction of turbines and associated road and power infrastructure) are likely to take place. However, because birds are highly mobile animals, and because an important potential impact is the effect of the WEF on birds which move through the proposed development area, as well as those which are resident within it, the avian impact zone of any proposed WEF extends well beyond the boundaries of this central core. Of particular concern is that monitored areas are large enough to include the considerable space requirements of large birds of prey, which may reside tens of kilometres outside of the core development area, but regularly forage within it (Walker *et al.* 2005, Madders and Whitfield 2006, Martinéz *et al.* 2010). How far the study area extends in each case should be determined by the on-site specialist, and should be defined at the scoping stage of the assessment process, perhaps with opportunity for subsequent refinement during the AIA stage.

Generally, the extent of the broader impact zone of each project will depend on the dispersal ability and distribution of important populations of priority species that are likely to move into the core impact area with some regularity. It is important that the delineation of this inclusive impact zone, which is the area within which all survey and monitoring work will be carried out, is done realistically and objectively, balancing the potential impacts of the wind farm with the availability of resources to conduct the monitoring.

(ii) To characterize the site in terms of:

- the avian habitats present,
- an inclusive list of species likely to occur there,
- an inclusive list of priority species likely to occur there, with notes on the relative value of the site for these birds,
- input on likely seasonality of presence/absence and/or movements for key species,
- any obvious, highly sensitive, no-go areas to be avoided by the development from the outset.

This should be done by means of:

- a desk-top study of the local avifauna, using relevant, pre-existing information (Hockey *et al.* 2005) and datasets - for example the BirdLife South Africa / Endangered Wildlife Trust avian wind farm sensitivity map for South Africa (Retief *et al.* 2012), the Southern African Bird Atlas data (SABAP 1 - Harrison *et al.* 1997, and SABAP 2), Coordinated Waterbird Counts (CWAC, Taylor *et al.* 1999), Coordinated Avifaunal Roadcounts (CAR, Young *et al.* 2003), the Birds in Reserves project (BIRP) and the Important Bird Areas initiative (Barnes 1998) (for updates on all these datasets see http://adu.org.za/), as well as data from the Endangered Wildlife Trust's programmes and associated specialist research studies, and

- a short (2-4 day) site visit to the area to search for key species and resources, and to develop an on-site understanding of where (and possibly when) priority species are likely to occur and move around the site (note that such a visit will not allow for seasonal variation in the composition and behaviour of the local avifauna, and such variation must therefore be estimated in terms of the existing information for the site or region, and the experience of the consulting specialist).

(iii) To provide an initial estimation of likely impacts of the proposed WEF, and to assess the nature and scale of baseline monitoring required to measure these impacts, and to provide input on mitigation.

In summary, the reconnaissance exercise should yield a scoping report describing the avifauna at risk detailing the nature of that risk and options for mitigation, as well as outlining the baseline monitoring effort required to inform the AIA report. Whilst the reconnaissance study could in some cases coincide with and serve as the scoping study, it is not necessary to wait until scoping starts in order to start monitoring. As a useful by-product of this work, specialists should be encouraged to register with the SABAP 2 project (http://sabap2.adu.org.za/), and to complete atlas cards for the pentads (5 x 5 minute squares) making up each development site, on every site visit (including those made during baseline and post-construction monitoring).

Note: In many cases, by this stage in the process a prospective developer has already erected a number of 15-80 m high, guyed lattice masts at locations around the proposed development area in order to gather wind data for the project. Ideally, specialists should have been consulted before the installation of these masts on the need to attach markers to the guy wires in order to reduce collision risk for birds, but this often not the case. In the event that guy wires of existing guyed masts have not been marked, specialist should provide input in reconnaissance reports on the need to do so retrospectively. Also, all such masts should be checked for collision mortalities from the onset of baseline monitoring until the completion of post-construction monitoring (see below).

2.2 Stage 2: Baseline monitoring

The products of this stage in the process should substantially inform the AIA report, and be the basis upon which the RoD is issued by DEA.

The primary aims of baseline monitoring are:

(i) To estimate the number/density of birds regularly present or resident within the broader impact area of the WEF before its construction.

(ii) To document patterns of bird movements in the vicinity of the proposed WEF before its construction (e.g. Erickson *et al.* 1999).

(iii) To estimate predicted collision risk (the frequency with which individuals or flocks fly through the future rotor swept area of the proposed WEF – Morrison 1998, Band *et al.* 2007) for key species.

(iv) To inform comment on the merits of the application in the AIA report in terms of points (i) to (iii).

(v) To establish a pre-impact baseline of bird numbers, distributions and movements.

(vi) To mitigate impacts by informing the final design, construction and management strategy of the development.

Reference sites

Monitoring data should be generated for both the broader impact zone of the proposed WEF, and for one or more comparable reference sites. In this way, a comparison of data from pre- and post-construction monitoring can be calibrated in terms of an equivalent comparison for a suitable reference area, and the effects of regional variation in environmental conditions can be filtered out of the resulting quantification of the actual impacts of the WEF (Anderson *et al.* 1999, Scottish Natural Heritage 2005, Stewart *et al.* 2007, Pearce-Higgins *et al.* 2009). Note that, whenever possible, close neighbouring WEF development areas could use a common reference site to minimize the time taken to locate a suitable area and acquire data, and the corresponding costs to the client.

Suitable reference sites should:

- match the range of habitats and topography of the proposed WEF site,
- host a similar mix of bird species to those present on the WEF site,
- be at least half the size of the wind farm area,
- be located on ground with a similar mix of habitats and similar topography and aspect (Pearce-Higgins *et al.* 2009),
- be situated as close as possible to the wind farm area, but far enough away to ensure that resident birds on the reference site are not directly affected by the wind farm operations once they start, and also that there is little, if any, localised movement of key species between the two areas.

Duration and frequency of monitoring

Monitoring data also should be collected over at least a 12 month period (at both WEF and reference sites), and include sample counts representative of the full spectrum of prevailing environmental conditions likely to occur on each site in a year (Drewitt & Langston 2006). This time-span may not have direct biological relevance, but presents a useful compromise between the extremes of either attempting to accommodate inevitable (and probably significant) variation between years, or just distilling the process into a sampling window of only six months, spanning the period between mid-winter and mid-summer. The former option is practically impossible, while the latter is too simplistic and abbreviated to be worthwhile. Within a 12 month sampling period, the frequency of site visits should be determined by the perceived sensitivity of the site, modulated by practical constraints (human capacity, size and accessibility of the site, time, finances). Four visits to the site over 12 months should be considered as an absolute minimum for achieving adequate coverage. Note that the quality and utility of the monitoring data is generally proportional to sampling frequency, so the number of iterations of each sampling technique per site visit, and the number of site visits per year, should always be kept at a practical maximum.

Equipment and mapping

Ideally, field workers should operate in pairs on the assumption that two people working together are likely to see and record more, and maintain higher health and safety standards, than one person working alone, but without significant additional costs that may be incurred by the deployment of larger teams. On occasion, it may be possible for experienced observers to effectively and safely survey small project areas alone.

Field teams will require a number of specialized items of equipment in order to gather monitoring data accurately, quickly and efficiently. In many cases, they will require the use of an off-road vehicle (ideally a 4x4) to make maximum use of the available road infrastructure on site. Each team member will need a pair of good quality binoculars, and each team will need a spotting scope and a recent regional bird identification guide. A GPS, a digital camera and a means to capture data – a notebook, datasheets, or generic or customized PDA – are also essential equipment. Electronic data capture devices, digital video cameras, hand-held weather stations and laser range-finders are useful, optional extras, that will facilitate the rapid acquisition, collation and processing of the maximum amount of relevant and accurate information on each site visit.

Before sampling and counting commence, the avian habitats available on both the project and the reference sites should be mapped using a combination of satellite imagery (Google Earth) and GIS tools. These maps can later be subject to ground-truthing and refinement according to on site experience and/or the findings of scoping phase botanical surveys. Each field team should have at least one set of hard-copy maps (at a minimum scale of 1:50 000) covering the full study area for accurate navigation and plotting of sightings. Digital maps of the area, on which sightings can be plotted directly in digital format, are useful, optional extras, which should facilitate the accurate capture of spatially explicit information.

2.2.1 Bird numbers or densities

Bird population monitoring at southern African WEF development sites presents some unique challenges. Monitoring protocols from Europe and the USA are mostly designed for estimating population densities of small passerines, and/or for use in relatively small development areas (Anderson *et al.* 1999, Erickson *et al.* 1999, Scottish Natural Heritage 2005, Smallwood *et al.* 2009). In southern Africa, many of the proposed developments cover very large areas, many of the priority species are large birds (cranes, bustards, eagles, vultures), with proportionally large space requirements and sparse distributions (Jenkins 2011), and some of the key species are nomadic, with fluctuating densities related to highly stochastic weather events that drive local habitat conditions. These different dispersion parameters render many traditional approaches to monitoring inappropriate and/or ineffective. Furthermore, some of the proposed development sites are situated in remote and rugged terrain, and access limitations may preclude uniform and/or random sampling of all habitats. Hence sampling methods and sample sizes may be determined as much by what is practically possible as by what is required for statistical rigor (although every effort should be made to cover a representative cross-section of the available habitats, or at least to sample those areas most likely to hold priority species). Lastly, there is currently a dearth of suitably experienced people available to do this monitoring, so the quality of the work done is likely to be limited by capacity shortfalls, at least in the short term.

In this context, and within these limitations, it remains a stringent requirement that bird numbers, distributions and activities are monitored as accurately as possible at all proposed WEF and reference sites, including data for a representative range of avian guilds.

Sample counts of small terrestrial species

While the emphasis of any monitoring project should be on the priority species identified at the scoping stage (and any other threatened and/or restricted range endemics seen and added to this list subsequently), there is a perceived need to monitor particularly the displacement effects of WEFs on small bird populations, even when these do not include species prioritized by the scoping exercise. This is more to further our understanding of the general effects of WEFs, and in particular the possible cumulative impacts of widespread WEF development on the broader avifauna, than to fulfill any immediate and localized conservation requirement. Given the potentially very large area put to wind energy development in 10-20 years time (http://www.sawea.org.za/), we need to assess now whether or not components of small bird communities are likely to be displaced, before we effect landscape-scale distributional changes, with the longer-term ecological damage that such changes could bring.

Most WEF developments are proposed for open, quite homogeneous terrain, in which small bird populations are relatively visible and uniformly distributed. Such conditions favour the use of walked, linear transect methods over other survey techniques (Bibby *et al.* 2000). The length, number and distribution of these transects on each site may vary according to site size, habitat diversity, and the richness and relative significance of the small terrestrial avifauna. Ideally, all the major habitat types present should be sampled approximately in proportion to their availability on site. Transects should be positioned at varying distances away from the proposed turbine arrays to maximize the value of the data in comparison with post-construction survey results.

Transects should be walked slowly and carefully, and work should commence from as soon as it is light enough to see clearly in the early morning and extend only until mid-morning, avoiding the warmer middle of the day when birds are less active and vocal, and hence less conspicuous (Bibby *et al.* 2000). If it is not possible to compress all transects into this time period, it is important to otherwise standardize for time of day in project design and/or subsequent data analysis to minimize the possible effect of this factor on survey results. As a general rule, transects should not be walked in adverse conditions, such as heavy rain, strong winds or thick mist. The species, number and perpendicular distance from the transect line of all birds seen should either be measured (preferably using a laser range-finder), estimated by eye, or estimated in terms of pre-selected distance bands (0-10 m, 11-50 m, 51-200 m, >200 m), and recorded for subsequent analysis using DISTANCE (Buckland *et al.* 2010, http://www.ruwpa.st-and.ac.uk/distance/distanceabout.html) or equivalent approaches (Bibby *et al.* 2000). Alternatively, transects can be done with a fixed maximum width, and only birds seen or heard within this distance on either side of the transect line should be recorded (e.g. Leddy *et al.* 1999). These methods yield estimates of density (birds.km^{-2}) for all open country passerines and most other small species, although these estimates are crude for the latter approach as it assumes that the detection rate for different species is constant across the width of the transect (grossly underestimating densities of inconspicuous species). Even distance-based line transects will underestimate actual densities if only a proportion of the population is detected (e.g. singing males). The main concern for comparative studies is that the same technique (and ideally the same observer) is used for all counts throughout the pre- and post-implementation monitoring. Note that a heavy reliance on calls in pre-construction surveys may preclude direct comparison of these data with those collected post-construction, when the noise of the operating turbines may significantly reduce the observers' ability to hear, locate and identify calling birds.

Recommended variables to record for each transect include:

- Project name
- Transect number
- Date
- Observer/s
- Start/finish time
- GPS location at start and finish
- Distance covered (m)
- Habitat type/mix of habitat types
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)
- Temperature at start
- Cloud cover at start
- Wind strength/direction at start
- Visibility at start (good, moderate, poor)
- Position of sun relative to direction of walk (ahead, above, behind)

  And, whenever possible, variables to record for each observation should include:

  - Time
  - Species
  - Number (number of adults/juveniles/chicks)
  - Activity (flushed, flying-display, flying-commute, perched-calling…)
  - Seen or heard?
  - GPS on transect line
  - Distance and direction from observer
  - Perpendicular distance off transect line (m) (if required)
  - Distance band off the transect line (if required)
  - Fixed transect width (if required)
  - Plot on map
  - Additional notes

Another acceptable way to measure small bird densities is to use fixed point counts, in which the observer is positioned at one location (chosen either randomly or systematically to ensure coverage of all available habitats), and records the species and sighting/registration distance of all birds seen over a prescribed period of time. This technique is particularly useful for measuring avian densities in closed habitats with raised and/or dense vegetation (Bibby *et al.* 2000), and can include the use of vocal as well as visual cues as evidence of species presence, particularly valuable in conducting surveys of more cryptic and inconspicuous species (Bibby *et al.* 2000). Again, survey locations should be selected to represent the habitats covered more or less in proportion to their availability. The duration of each count period should be long enough to detect all the birds within the survey area, but short enough to avoid including birds that were not present in the area at the start. As with line transects, the distance from the static observer to each bird or flock of birds registered can either be measured directly (by estimation or using a laser range-finder), or allocated to a range of circular bands of distance from the observer, or else the count can be done with a fixed detection radius, including only the birds seen within this distance (Bibby *et al.* 2000).

Recommended variables to record for each such fixed point count include:

- Project name
- Fixed point number
- Date
- Observer/s
- Start/finish time
- GPS location
- Habitat type/mix of habitats
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)
- Temperature at start
- Cloud cover at start
- Wind strength/direction at start
- Visibility at start (good, moderate, poor)

And, whenever possible, variables to record for each observation should include:

- Time
- Species
- Number (number of adults/juveniles/chicks)
- Activity (flushed, flying-display, flying-commute, perched-calling…)
- Seen or heard?
- Distance to bird (m) (if required)
- Distance band containing bird (if required)
- Fixed radius of count (m) (if required)
- Additional notes

A further alternative method of measuring the occurrence and relative abundance of small terrestrial species (although in this instance, <u>all</u> species are included in the data collection protocol) is the "checklist survey". This method does not measure absolute density of species, as do the transect and fixed-point methods described in this document, but provides a measure of relative density based on the "reporting rate". In its simplest form, the reporting rate is the proportion of checklists for a particular area which record a particular species. The protocol recommended here is the one used by SABAP2, the second South(ern) African bird atlas project, details of which are available on the project's website (http://sabap2.adu.org.za/). The objective of checklist surveys and analysis is to provide a robust comparison of relative density, per species, between the pre- and post-construction conditions.

The advantage of the checklist survey is that the method is easy to apply in situations where methods of counting birds may be difficult to apply in a consistent manner, for example, where habitats are diverse or visibility limited, and the survey area is very large (Royle & Nichols 2003, Joseph *et al.* 2006). Its disadvantage is that it is dependent on not one, but a series of checklists (preferably at least 10), recorded at different times, so that a robust relative-density statistic can be calculated. Checklist surveys are suitable for monitoring species in the broad "affected area" of the WEF, but should be complemented by transect or fixed-point counts conducted more strictly within the turbine development area (see protocol in this document). The latter counts will provide a more sensitive measure of density at the localities most likely to be impacted by the turbines. (Such transect or point counts could often be done from the same locations as vantage-point monitoring.)

The protocol for a checklist survey requires (a) the definition of a survey area, (b) the application of a minimum amount of survey effort, and (c) coverage of all habitat types within the survey area. All species are recorded as present only, i.e., individuals are not counted. In addition, the order in which species are first observed is recorded, as well as the total number of new species per hour of observation. The minimum amount of time allocated to each checklist should be sufficient to permit coverage of all the habitat types in the survey area: two hours is the specified minimum in the SABAP2 protocol, with a maximum of five days. Note that while larger species and priority species should be included in checklist surveys, these do not replace other methods of measuring the density of these birds, which include the capture of critical information on absolute rather than relative abundance (although see Wenger & Freeman 2008).

For SABAP2, the survey area is the "pentad", a cell of roughly 8x9 kilometres, created by a 5x5-minute grid. The size of a pentad makes it advisable to survey using a vehicle to cover the area. Pentads are suitable survey areas for large WEFs and the data collected will be compatible with the SABAP2 database. Every pentad which includes a portion of the WEF should be surveyed, as a minimum. Relatively small WEFs (<4 kilometres in extent) would perhaps be better served by transect or point counts (described in this document). Statistical analysis of SABAP2-style checklist data is more sophisticated than a simple proportion or percentage of checklists with presence records (as used in SABAP1), and will be described further in a later revision of these guidelines.

Counts of large terrestrial species and raptors

Large terrestrial birds, e.g. cranes, bustards, storks, and most raptors, cannot easily be surveyed using walked transects for reasons discussed above. Populations of such birds should be estimated on each visit to the project area either by means of an 'instantaneous' absolute count (only possible at relatively small proposed WEFs) or by means of vehicle-based sampling (best applied at relatively large proposed WEFs, especially those with good networks of roads and tracks). Any obvious breeding pairs and/or nest sites located during this survey work should be plotted and treated as focal sites for subsequent monitoring (see below).

Absolute counts of key species involves searching as much of the broader impact area of the WEF (or the reference site) as possible in the course of a day, using the available road infrastructure (or otherwise walking) and prominent vantage points to access and scan large areas, and simply tallying all the individuals observed. This is only practical for the largest and most conspicuous species, and probably is only effective for cranes and bustards. If necessary, counts can be standardized for observer effort (time, area scanned, methods used), but ideally they will be working estimates of the absolute number of each target species present within the study area on that sampling day.

Recommended variables to record for each absolute count of large, priority species include:

- Project name
- Count number
- Date
- Observer/s
- Start/finish time
- Temperature at start
- Cloud cover at start
- Wind strength/direction at start
- Visibility at start (good, moderate, poor)

And, whenever possible, variables to record for each observation should include:

- Time
- Species
- Number (number of adults/juveniles/chicks)
- Activity (flushed, flying-display, flying-commute, perched-calling…)
- Flight direction (if required)
- Flying height (if required - <30m, 30-150m, >150m)
- GPS location of observer
- Distance and direction from observer
- Plot birds sighted on map
- Habitat type/mix of habitats
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)
- Seen close to (feedlot, dam, river course, ridge or cliff-line…)

- Seen while driving/walking/scanning
- Additional notes

Sample counts of large terrestrial birds and raptors require that one or a number (depending on site size, terrain and infrastructure) of driven transects be established, comprising one or a number of set routes, limited by the existing roadways but as far as possible directed to include a representative cross section of habitats on site. These transects should be driven slowly, and all sightings of large terrestrial birds and raptors should be recorded in terms of the same data capture protocols used for walked transects (above), and in general compliance with the road-count protocols described for large terrestrial species (Young *et al.* 2003) and raptors (Malan 2009). In addition, each transect should include a number of stops at vantage points to scan the surrounding area. If sighting distance is used to delineate the area sampled, this method will yield estimates of density ($birds.km^{-2}$) for all large terrestrial species and birds of prey. Alternatively, variation in sighting distances (perhaps associated with variable terrain of habitat) may preclude the use of this method, and it may only be possible to determine a simple index of abundance, expressed as the number of birds seen per kilometre driven.

Recommended variables to record for driven transect counts of large terrestrial species and raptors include:

- Project name
- Transect number
- Date
- Observer/s
- Start/finish time
- GPS location at start/finish
- Odometer reading at start/finish
- Distance covered (km)
- Temperature at start
- Cloud cover at start
- Wind strength/direction at start
- Visibility at start (good, moderate, poor)

And, whenever possible, variables to record for each observation should include:

- Time
- Species
- Number (number of adults/juveniles/chicks)
- Activity (flushed, flying-display, flying-commute, perched-calling…)
- Flight direction (if required)
- Flying height (if required - <30m, 30-150m, >150m)
- Seen while driving/scanning?
- Habitat type/mix of habitat types
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)

- Seen close to (feedlot, dam, river course, ridge or cliff-line…)
- GPS on transect line
- Perpendicular distance off transect line (m) (if required)
- Distance band off the transect line (if required)
- Fixed transect width (if required)
- Plot on map
- Additional notes

Focal site surveys and monitoring

Any habitats within the broader impact zone of the proposed WEF, or an equivalent area around the reference site, deemed likely to support nest sites of key raptor species (including owls) - cliff-lines or quarry faces, power lines, stands of large trees, marshes and drainage lines - should be surveyed using documented protocols (Malan 2009) in the initial stages of the monitoring project. All such sites should be mapped accurately, and checked on each visit to the study area to confirm continued occupancy, and to record any breeding activity, and the outcomes of such activity, that may take place over the survey period (Scottish Natural History 2005). Any nest sites of large terrestrial species (e.g. bustards and especially cranes) that may be located should be treated in the same way, although out of season surveys are unlikely to yield results as these birds do not hold year-round territories.

Recommended variables to record for each nest site survey should include:

- Project name
- Date
- Observer/s
- Species
- Site name, number or code
- Type of site (nest, roost, foraging…)
- Time checked
- Temperature
- Cloud cover
- Wind strength/direction
- Visibility (good, moderate, poor)
- Signs of occupation (fresh droppings, fresh food remains, freshly moulted feathers…)
- Signs of breeding activity (adults at nest, adult incubating or brooding, eggs or nestlings…)
- Number of adults/eggs/nestlings/juveniles seen
- Additional notes

The major wetlands on and close to the development area should also be identified, mapped and surveyed for waterbirds on each visit to the site, using the standard protocols set out by the CWAC initiative (Taylor *et al.* 1999).

Recommended variables to record for each wetland survey should include:

- Project name
- Date
- Observer/s
- Wetland name, number or code
- Time at start/finish of count
- GPS location at observation point
- Temperature
- Cloud cover
- Wind strength/direction
- Visibility (good, moderate, poor)

  And, whenever possible, variables to record for each species counted should include:

    - Species
    - Number (number of adults/juveniles/chicks)
    - Direction of arrival/departure from wetland (if applicable)
    - Additional notes

Note: As an extension of the focal site/wetland monitoring protocol, any guyed masts present on the proposed development area should be checked on each iteration for signs of bird collisions, and the findings should be recorded as per post-construction collision victim surveys (see below).

Incidental observations

All other, incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area should be carefully plotted and documented. These could include details of nocturnal species (especially owls) heard calling at night.

Recommended variables to record for each incidental observation of priority species should include:

- Project name
- Date
- Observer/s
- Time
- Temperature
- Cloud cover
- Wind strength/direction
- Visibility (good, moderate, poor)
- Species
- Number (number of adults/juveniles/chicks)
- Activity (flushed, flying-display, flying-commute, perched-calling…)
- Flight direction (if required)
- Flying height (if required - <30m, 30-150m, >150m)
- GPS location of observer
- Plot birds sighted on map
- Habitat type/mix of habitats

- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)
- Seen close to (feedlot, dam, river course, ridge or cliff-line…)
- Seen while driving/walking/scanning
- Additional notes

2.2.2 Bird movements

A spatially explicit understanding of bird movements in and around a proposed WEF site may be more important to determining the sustainability of the project, and to informing an effective mitigation strategy, than knowledge of the numbers of key species present. Developing such an understanding requires a significant investment of time and effort, and may require the use of expensive, highly technical remote sensing equipment.

Radar

The state of the art in monitoring bird movements in relation to WEFs involves the use of custom-built radar installations (e.g. http://www.detect-inc.com/wind.html). When set up correctly, these systems can provide round-the-clock coverage of a sizeable area in all weather conditions. They are expensive, and cannot easily distinguish between different species, types or even sizes of birds, but when used in combination with limited direct observation (primarily to calibrate and ground-truth remotely collected information), they are likely to provide the most comprehensive and accurate data possible describing the frequency, height and direction of bird flight paths through a proposed or operational wind farm. The use of a radar system is likely to add significant value to any monitoring project, but may be essential and non-negotiable for use at certain sites as the only means to obtain critical data on large scale movements of birds, or movements of significant numbers of highly threatened species, thought or known to take place at night or in conditions of poor visibility.

Such a situation pertains in the Cape West Coast area between Vredenburg and Velddrif, and including the Cape Columbine Peninsula. This relatively small area lies directly between the West Coast National Park (including Langebaan Lagoon and the Saldanha Bay islands) and the Lower Berg River estuary. Both these locations are listed as Important Bird Areas (Barnes 1998), and between them support 10 000s of waterbirds, and 100 000s of coastal seabirds (including large numbers of red-listed and/or endemic species such as Great White Pelican *Pelecanus onocrotalus*, Greater Flamingo *Phoenicopterus ruber*, Lesser Flamingo *Phoeniconaias minor*, Cape Cormorant *Phalacrocorax capensis* and Caspian Tern *Hydroprogne caspia*).

Figure 1. *The location of properties included in WEF development proposals in the Saldanha Bay/Velddrif area in relation to key wetland and coastal bird sites on the Lower Berg River, and at Saldanha Bay and Langebaan Lagoon. Anticipated, large-scale, nocturnal movements of birds between these resource areas, and through the proposed wind energy development area, necessitate the use of radar for effective baseline monitoring.*

At present, at least eight wind energy projects are proposed for this area, possibly covering 1000s of hectares and comprising 100s of turbines. The cumulative impact (Masden *et al.* 2009) of these multiple, close-neighbouring WEFs may be substantial, with a strong likelihood that at least some of the proposed turbine arrays impinge on preferred flight lines of wetland and coastal birds between prime resource areas to the north or south (Figure 1). Many of the larger scale movements made by water birds occur at night, so current understanding of the routes used is extremely poor, and is likely to remain so without the strategic deployment of radar to determine if, when, how and how many birds make these potentially hazardous flights, and under what weather conditions (note that radar functionality is reduced in conditions of heavy rainfall). Such information is vital to ensuring that wind energy development in this area proceeds sustainably.

Direct observation

The use of observers positioned on site is the low-tech, labour intensive alternative to radar. The main advantage of this method is that birds are sighted and identified directly by observers in the field, adding greater species specificity to the information collected. The disadvantages include the tedium of spending hours in the field collecting data, the resulting constraints on the quantities of such data that can be accumulated, the inability of observers to gather meaningful movement data at night or in daytime conditions of low visibility, and the risk that sampling periods will miss or under-represent episodic mass movements of birds (Scottish Natural Heritage 2005).

Counts of bird traffic over and around a proposed/operational facility should be conducted from suitable vantage points which together provide overview of as much of development area as possible (Scottish Natural Heritage 2005). Ideally, to achieve seamless coverage, vantage points should be spaced a maximum of 2 km apart (Scottish Natural Heritage 2005), but capacity constraints in South Africa are likely to stretch this distance substantially, particularly at very large WEF sites. GIS can be used to facilitate the identification of vantage points with the best inclusive viewsheds, bearing in mind that ready accessibility for observers is also a significant factor in the final selection. Observation and data collection should ideally be focused in the direction of the proposed development area from the vantage point, extending to 90° on either side of that focal point. Bird movement taking place further 'behind' the observers may be relevant, and should be included at the discretion of the site specialist or the fieldworkers at the time, but not at the expense of effective 'forward' coverage.

Vantage point watches should extend alternately from before dawn to midday, or from midday to after dusk, so that the equivalent of at least one full day of counts is completed at each vantage point for each site visit. Alternatively, watches can be divided into three hour shifts distributed through the day (early morning, midday, late afternoon), although this may prove impractical at vantage points that are relatively difficult to reach. Either way, scheduling should always allow for the detrimental effects of observer fatigue on data quality. When extended across the 12 month monitoring period, these sorts of regimens should provide an adequate (if minimal) sample of bird movements around the facility in relation to a representative cross-section of conditions and times of day (Erickson *et al.* 1999, Scottish Natural Heritage 2005, Krijgsveld *et al.* 2009). Note that nighttime watches coincident with clear, moonlit conditions would also be valuable at sites where nocturnal activity is considered likely or possible.

The purpose of vantage point watches is to collect data on priority species to allow estimation of:

- The time spent flying over the proposed development area
- The relative use of different parts of the development area
- The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height of the turbines to be used
- The flight activity of other bird species using the development area.

Recommended variables to record for each vantage point survey should include:

- Project name
- Vantage point name/number
- Date
- Observer/s
- Start/finish time
- GPS location
- Temperature at start
- Cloud cover at start
- Wind strength/direction at start#
- Visibility at start (good, moderate, poor)

And, whenever possible, variables to record for each observation should include:

- Time sighted
- Species
- Number (number of adults/juveniles/chicks) at start and end of observation
- Temperature
- Cloud cover
- Wind strength/direction#
- Visibility (good, moderate, poor)
- Initial sighting distance (m)
- Flight mode (direct commute-flapping, direct commute-gliding, slope soaring…)*
- Underlying habitat*
- Gradient of underlying slope (flat, gentle, steep)*
- Aspect of slope (none, north, north-east, east…)*
- Flight direction*
- Flying height (<30m, 30-150m, >150m)*
- Identifiable flight path indicators (valley, neck or saddle, ridge line, thermal source…)
- Time lost
- Plot on map
- Additional notes

* These variables should ideally be recorded at 15-30 second intervals from the initial sighting, or at least with every change in flight mode, until the bird/flock of birds is lost.

\# Wind data can be measured directly using a hand-held anonemeter, and/or sourced from the wind data collected on-site by the developer for the relevant date and time.

Data gathered in this way can be used to model collision mortality risk (Scottish Natural Heritage 2009, Band *et al* 2007), assuming that birds included in measures of passage rate through the proposed rotor-swept area will take no avoiding action once the turbines are erected and operational. Such models can then be refined as information on actual avoidance rates in key species is accumulated during post-construction observations at working WEFs.

2.3 Stage 3: Post-construction monitoring

The primary aims of post-construction monitoring are to:

(i) Estimate the numbers/densities of birds regularly present or resident within the broader impact area of the operational WEF.
(ii) Document patterns of bird movements in the vicinity of the operational WEF.
(iii) Compare these data with baseline figures and hence quantify the impacts of displacement and/or collision mortality.
(iv) Quantify and qualify bird collisions with the turbine arrays, as well as additional mortality associated with guyed masts, power lines and other ancillary infrastructure (e.g. Anderson 2001, Lehman *et al.* 2007, Jenkins *et al.* 2010, Shaw *et al.* 2010a & b).
(v) Mitigate impacts of the development by informing ongoing management of the WEF.

2.3.1 Bird numbers and movements

All methods used to estimate bird numbers and movements during baseline monitoring should be applied in exactly the same way to post-construction work in order to ensure the comparability of these two data sets. Further detail on any differences in field techniques and data requirements (e.g. the timing of commencement of post-construction monitoring, the duration over which data collection should be carried out, the need to record bird reactions to the presence of operational turbines) will be provided in a later update of this document. For now, it is important to note that post-construction monitoring should be started as soon as possible after the first turbines become operational to ensure that the immediate effects of the facility on resident and passing birds are recorded, before they have time to adjust or habituate to the development, and should run over a period of at least 12 months to achieve direct comparability with pre-construction work. In many instances, and particularly where pre-construction data point to significant operational impacts, it may be necessary to extend post-construction monitoring to span multiple years.

2.3.2 Avian collisions

The primary aims of avian collision monitoring are to:

(i) Record and document the circumstances surrounding all avian collisions with the turbines, and all bird mortalities caused by ancillary infrastructure of the WEF.
(ii) To quantify the direct effects of the WEF on collision susceptible species.
(iii) To mitigate impacts by informing final operational planning and ongoing management.

Collision monitoring should have two components: (i) experimental assessment of search efficiency and scavenging rates of bird carcasses on the site, (ii) regular searches of the vicinity of the wind farm for collision casualties (Morrison 2002, Barrios & Rodríguez 2004, Krijgsveld *et al.* 2009).

Assessing search efficiency and scavenging rates

The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed (Morrison 2002). To do this, a sample of suitable bird carcasses (of similar size and colour to a variety of the priority species – e.g. Egyptian Goose *Alopochen aegyptiaca*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the field teams, some time before the site is surveyed. This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two-three visits to the site post-construction, with the total number of carcasses set out not less than 20, but not so plentiful as to saturate the food-supply for the local scavengers (Smallwood 2007). The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method (Morrison 2002, Barrios & Rodríguez 2004, Krijgsveld *et al.* 2009). The location of all carcasses not detected by the survey team should be checked subsequently to discriminate between error due to search efficiency (those carcasses still in place which were missed) and scavenge rate (those immediately removed from the area).

Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial surveys period, to determine the rates at which carcasses are scavenged, or decay to the point that they are no longer obvious to the field workers. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximise survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate (Osborn *et al.* 2000, Morrison 2002). Scavenger numbers and activity in the area may vary seasonally so, ideally, scavenge and decomposition rates should be measured at least twice over a monitoring year, once in winter and once in summer.

Collision victim surveys

The area within a radius of at least 80-120 m of each of the turbines (depending on rotor length) at the facility should be checked regularly for bird casualties (e.g. Anderson *et al.* 1999, Morrison 2002, Smallwood & Thelander 2008, de Lucas *et al.* 2008). The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted in the initial stages of the monitoring period (see above), but they should be done at least weekly over the first two months of the study. The area around each turbine, or a larger area encompassing the entire facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the following recommended variables:

- Project name
- Date
- Time
- Species
- Number adults/juveniles
- GPS location/s
- Condition of remains
- Nearest turbine number
- Distance to nearest turbine
- Compass bearing to nearest turbine
- Habitat type/mix of habitats
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east…)
- Plot on map
- Photograph the collision site as it was located

All physical evidence should then be collected, bagged and carefully labeled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above), including outcome and possible post-mortem.

In tandem with surveys of the wind farm for collision casualties, all guyed masts and sample sections of any new lengths of power line associated with the development should also be surveyed for collision and/or electrocution victims using established protocols (Anderson 2001, Shaw *et al.* 2010 a, b).

3. A step-wise approach to bird monitoring at a proposed wind energy site

The following are key steps in the successful design and implementation of bird monitoring at a proposed wind energy development site:

- Appoint a qualified and expert advising scientist and a capable monitoring agency to conduct pre- and post-construction monitoring.
- Get the monitoring protocols right – i.e. customise the generic guidelines to suite the specific issues at each site.
- Determine the extent of radar deployment required - if radar use is warranted, secure the budget, and acquire/hire hardware, software and relevant expertise, including the appointment of a radar technologist to service the project.
- Start baseline monitoring.
- Periodically collate and analyse baseline monitoring data, and adjust the data collection protocols and schedule to ensure that sufficient data are accumulated and sufficient coverage is achieved to adequately inform development decisions.
- Compile a report reviewing the full year of baseline monitoring, and integrate these findings into the Environmental Management Plan (EMP) for the project and the broader mitigation scheme.
- Determine whether certain anticipated impacts warrant the implementation of 'during construction' monitoring, and how this can best be achieved subject to construction schedules and activities.
- Ensure that the EMP is applied during construction.
- Refine the post-construction monitoring protocol in terms of the baseline work, and determine the extent of radar deployment required.
- Start post-construction monitoring.
- Periodically collate an analyse post-construction monitoring data, and adjust the data collection protocols and schedule to ensure that sufficient data are accumulated and sufficient coverage is achieved to adequately inform operational decisions.
- Compile a report reviewing the full year of post-construction monitoring, integrate the findings into the EMP for the operating wind farm and the broader mitigation scheme, and review the need for further post-construction monitoring.

4. Data Management

While analysis and reporting on an individual WEF basis will be the responsibility of the relevant avifaunal specialist, all data emanating from the above process should ultimately be housed centrally by the South African National Biodiversity Institute (SANBI), with BAWESG guidance, to facilitate the assessment of results on a multiple WEF, landscape and national scale. Permission to publish the findings of such analysis in the relevant media by EWT/BirdLife South Africa, BAWESG or by accredited academic institutions should be obtained from the developer before the onset of monitoring (and hopefully will not be unreasonably withheld). This pooling of information is in the interests of collective understanding and building a sustainable renewable energy industry in southern Africa.

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Sent:	22 March 2016 11:32
To:	Andrea Gibb
Cc:	nicolenev@zitholele.co.za; Lynsey Rimbault; 'Samantha Ralston'
Subject:	RE: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process
Attachments:	BLSA_EWT_ Best Practice Monitoring Guidelines_2012.pdf; Wind Energy Minimim Assessment Requirments 4 April.pdf; Wind_Energy_and_Biodiversity_Offsets.pdf; Wind_Energy_and_birds.pdf

Hi Andrea,

Please register BirdLife South Africa as an I&AP on this project, using my details below. I have attached our assessment guidelines for WEFs. Please pass these on to your project team.

Many thanks,

Simon Gear
Policy & Advocacy Manager

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BirdLife INTERNATIONAL rspb giving nature a home

From: Hlengiwe Ntuli [mailto:HlengiweN@sivest.co.za]
Sent: 18 March 2016 05:15 PM
Cc: Andrea Gibb <AndreaG@sivest.co.za>; nicolenev@zitholele.co.za; Lynsey Rimbault <LynseyR@sivest.co.za>
Subject: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

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Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

• EUREKA EAST WEF – DEA Ref No: To be announced
• EUREKA WEST WEF – DEA Ref No: To be announced
• ALETTA WEF – DEA Ref No: To be announced
• EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced
• ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced

• INVITATION TO PARTICIPATE IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of the EIA Regulations and the National Environmental Management Act, 1998 (Act No. 107 of 1998), SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) has been appointed as the independent Environmental Assessment Practitioner (EAP) by BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) to conduct the EIA processes for the proposed development of the Eureka East, Eureka West and Aletta 140MW WEFs, and the BA processes for the two (2) associated substations and 132kV power lines. The proposed projects are located in the Northern Cape Province near Copperton.

SiVEST would like to invite you, as a potential Interested and/or Affected Party (I&AP), to become actively involved in the EIA and Public Participation Process (PPP) for this proposed project. The aim of this process is as follows:

♣ to ensure that all the relevant environmental impacts are taken into consideration;
♣ to ensure public input; and
♣ provide decision-makers with sufficient information to make an informed decision on the proposed activities.

Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.
****

Geagte Belangstellende en/of Geaffekteerde Party

OMGEWINGSIMPAKEVALUERINGS (OIE’s) EN OMGEWINGSBESTUURSPROGRAMME (OBPR’e)
VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA’s), EN BASIESE EVALUERINGS (BE’s) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

• EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word
• EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word
• ALETTA WKA – DO Verw. No.: Moet aangekondig word
• EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word
• ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word

• UITNODIGING OM DEELNAME AAN DIE OMGEWINGSIMPAKEVALUERINGSPROSES

Ingevolge die OIE-regulasies en die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998), is SiVEST SA (Edms.) Bpk. (hierna SiVEST genoem) deur BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) aangestel as die onafhanklike Omgewingsevalueringspraktisyn (OEP) ten einde die OIE-prosesse vir die beoogde ontwikkeling van die Eureka-Oos, Eureka-Wes en Aletta 140 MW WKA’s en die BE-prosesse vir die twee (2) gepaardgaande substasies en 132 kV kraglyne te onderneem. Die beoogde projekte is naby Copperton in die Noord-Kaapprovinsie geleë.

SiVEST nooi u, as ’n potensiële Belangstellende en/of Geaffekteerde Party (B&GP), om aktief by die OIE en Openbare Deelnameproses (ODP) vir hierdie beoogde projek betrokke te raak.

Die doel van hierdie proses is om:
♣ toe te sien dat al die tersaaklike omgewingsimpakte in ag geneem word;
♣ openbare insette te verseker; en
♣ besluitnemers van voldoende inligting te voorsien ten einde ’n ingeligte besluit oor die beoogde aktiwiteite te neem.

Aangeheg is die Agtergrondinligtingsdokument (AID) wat inligting rakende die beoogde projek, asook die beoogde OIE BE en ODP bevat.

Deur die meegaande registrasie- en kommentaarvorm in te vul en in te dien, sal u as ’n B&GP op die projek se databasis geregistreer word.

Ons bedank u by voorbaat dat u deel word van die Openbare Deelnameproses en ons sien daarna uit om u waardevolle insette betreffende die beoogde projek te ontvang.

Die uwe

Andrea Gibb (B.Sc. Landscape Architecture; B.Sc.(Hons) Environmental Management) Environmental Practitioner and Visual Specialist SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

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Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

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Minimum Requirements

for Avifaunal Impact Assessment

for Wind Energy Facilities

Wind energy facilities can have unintended negative impacts on avifauna, but many of these impacts can be avoided with careful planning and siting of the facility. For this reason, BirdLife South Africa and the Endangered Wildlife Trust (EWT) recommend that an objective, structured and scientifically rigorous impact assessment by an avifaunal specialist is included in the impact assessment for all proposed wind farms[i]. These proposed terms of reference are in line with international best practice and are intended to set a minimum standard for impact assessment throughout the industry.

An avifaunal impact assessment for a wind energy facility should follow a two-tier process[ii]:

1. Scoping – which will encompass a review of existing literature and data, as well as site visit to inform the design of a site-specific survey and pre-construction monitoring plan.

2. Impact assessment – systematic and quantified monitoring over four seasons that will inform a full Environmental Impact Assessment (EIA) detailing and analyzing the significance of likely impacts and available mitigation options.

1. Scoping

The scoping assessment should be based on a review of existing literature and bird atlas data[iii], the BirdLife South Africa and Endangered Wildlife Trust Avifaunal Wind Farm Sensitivity Map, distance from protected areas and recognized Important Bird Areas, as well as avifaunal data collected during a brief site visit to the proposed wind farm site. The Scoping Report should contain the following information:

a. A description of the site in terms of the avifaunal habitats present
b. A list of bird species and priority bird species[iv] likely to occur on the proposed site, with information on the relative value (in terms of breeding, nesting, roosting and foraging) of the site for these birds;
c. A description of the likely seasonal variation in the presence/absence of priority species and preliminary observations of their movements.
d. A preliminary delineation of areas that are potentially highly sensitive, no-go areas that may need to be avoided by the development;
e. A preliminary description of the nature of the impact that the proposed development may have on the bird species present;
f. A description of any mitigation measures that may be required to manage impacts related to the monitoring and assessment of the site[v].

The results of the scoping study, particularly information regarding the diversity and abundance of priority species that are likely to be present, proximity to important flyways, wetlands or other focal sites, and topographic complexity, should be used to:

a. Highlight if there are any obvious red flags to the proposed development on all or parts of the site;
b. Inform the required scope, effort, intensity and design of the baseline monitoring and impact assessment.

2. Impact assessment

The avifaunal impact assessment should be based on data collected from detailed site visits. Site visits must be of sufficient frequency to adequately sample all major variations in environmental conditions, with no fewer than four visits spanning all four seasons[vi]. The degree of effort during each survey should be informed by the likely sensitivity of the site and the species it contains, as well as the size of the proposed wind farm.

The impact assessment must include an analysis (statistical measurement and mapping) of the following variables:

a. Abundance estimates for small terrestrial birds (in most cases not priority species, but potentially affected on a landscape scale by multiple developments in one area), through linear transect surveys, fixed point counts or reporting rates;
b. Absolute counts, density estimates or abundance indices for large terrestrial birds and raptors, through road transects or vantage point monitoring;
c. Flight behavior of priority species flying in or near the future rotor swept area of the proposed development area[vii];
d. Occupancy/numbers/breeding success at any focal raptor sites;
e. Bird numbers at any focal wetlands and local movements between waterbodies;
f. Full details of any incidental sightings of priority species;
g. Collision mortalities related to any existing guyed lattice masts and existing powerlines.

The results of this analysis should be used to:

a. Develop a topographical map indicating the area that would be impacted by the proposed development alternatives[viii] and the location of key habitats and flyways that should not be developed or otherwise transformed.
b. Inform the final turbine layout (or where the layout cannot be finalized within the EIA, the assessment should be used to define no go areas and areas that should be sufficiently buffered).
c. Assess the significance of the potential impact of the proposed project alternatives and related activities - with and without mitigation - on avifaunal species and communities (with regards to potential disturbance, displacement, habitat loss and mortality through collision), including consideration of the spatial and temporal extent of these impacts.
d. Inform actions that should be taken to prevent or, if prevention is not feasible, to mitigate negative impacts during the planning, construction and operational phases of the development.
e. Inform the nature and extent of monitoring required during and post-construction[ix].
f. Highlight if the proposed development, is fatally flawed[x] and should not be recommended for approval.

The avifaunal impact assessment must include a description of the limitations and assumptions of the assessment. Where other proposed facilities are proposed in or near to the development in question, the impact assessment must include consideration of cumulative impacts[xi].

Important note on impact assessment, monitoring and reference sites.

In order to fully understand and successfully mitigate the possible impacts of proposed wind farms including the wind turbines and associated infrastructure on avifauna, it is essential that objective, structured and scientific monitoring of avifauna be initiated prior, during and post-construction. This should follow the *BirdLife South Africa / Endangered Wildlife Trust: best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa*[xii]. These guidelines are in line with international best practice and include monitoring protocols for evaluating wind energy development proposals in terms of their impacts on avifauna.

To avoid duplication of effort, it is recommended that the methods used in avifaunal impact assessment (described above) are designed such that the data gathered can also be used for pre-construction monitoring. In other words the impact assessment and pre-construction monitoring should be the same thing.

It is also recommended that, where possible, impact assessment/pre-construction monitoring at the proposed development site is coupled with the collection of directly comparable data at a nearby, closely matched control site. This will provide much-needed context for the analysis of pre- *vs.* post-construction monitoring data.

The reference site must be studied at the same time as the proposed development site.

There may be instances where a suitable control site is not available, but the specialist must clearly indicate when and why a control site will not be used. Should a control site not be used, it may be necessary to conduct monitoring over a longer period to account annual variation in the presence of some species and strengthen the conclusions .

In order to ensure consistency and comparability of results across projects, BirdLife South Africa requests the opportunity to review the proposed monitoring methodology prior to monitoring being initiated. BirdLife South Africa and Wildlife Energy Programme (WEP) - EWT also request that bird monitoring reports be forwarded to them, where the data will be centrally stored and analyzed by these organizations, to facilitate the assessment of results on a multi-project, landscape and national scale.

April 2013

Notes

[i] A list of avifaunal specialists who have agreed to follow the *BirdLife South Africa / Endangered Wildlife Trust: best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* is available at www.birdlife.org.za and www.ewt.org.za. Alternatively please email energy@birdlife.org.za.

ii The National Environmental Management Act EIA regulations indicate that facilities for the generation of electricity where: (i). the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii.) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare, need only be subject to a Basic Assessment process. However, it is recommended that these minimum requirements be applied to all wind energy facilities that meet the thresholds for electricity generation activities in Listing notices 1 and 2. The extent of the monitoring required (for example with regards to number of days and number of focal point surveys) would, however, be influenced by the size of the project. Should capacity of the proposed wind farm fall below the thresholds of the listed activities for electricity generation, but trigger other non-electricity-related listed activities, we recommend that an avifaunal specialist be consulted to guide on the scope of the assessment. The level of monitoring required would need to be decided on a case-by-case basis and should be dictated by the receiving environment.

[iii] Available bird atlas data incudes the Southern African Bird Atlas Project (1 and 2), Coordinated Waterbird Counts, Coordinated Avifaunal Roadcounts, Birds in Reserves Project.

[iv] Please refer to Annexure A of the Avian Wind Farm Sensitivity Map (Retief et al., 2012) for a list of priority species. Priority species are birds which are thought to be particularly vulnerable to the potential impacts of wind farms as a result of their conservation status (threatened species), distribution (endemic, near-endemic and range restricted species) and behavior which may make them susceptible to impacts from wind energy through displacement and direct collision with the wind turbines. These species should be the primary (but not necessarily the sole) focus of subsequent monitoring and assessment at the proposed site.

[v] For example, if guyed lattice masts are already in place for monitoring wind speed, the specialist may recommend that these be marked if there is a significant risk of priority species colliding with the wires.

[vi] It is important to ensure that avian specialist impact assessments address seasonal variance in order to account for migratory species, different altitudinal and seasonal movements of local non-migratory species as well as the changes in behaviour and flight patterns linked to breeding behaviour. This requirement may be relaxed in exceptional circumstances, for example if there is a high degree of confidence in existing information and a low risk to priority species. Please consult with an avian specialist and BirdLife South Africa in this regard.

[vii] In some situations, where proposed wind energy developments are likely to impinge on flyways used by relatively large numbers of threatened and impact sensitive birds, and particularly where these movements are likely to take place at night or in conditions of poor visibility (e.g. the Cape Columbine Peninsula), it may be necessary to use radar to gather sufficient information on flight paths to fully evaluate the development proposal and inform mitigation requirements. This methodology has significant cost implications and would only need to be considered in areas where wind energy potentially poses a high risk to birds.

[viii] The consideration of alternatives is central to impact assessment and all reasonable and feasible development alternatives should be investigated to help identify the best practicable environmental option. Since the location of a wind farm and the positioning of the turbines are key factors influencing the significance of the impacts on birds, alternative sites and alternative layouts should be considered. It is recognised that there are substantial cost implications to including site alternatives in the EIA process. Potential impacts on birds should therefore be considered in the screening of potential sites. This will reduce the likelihood of fatal flaws being encountered within the EIA process.

ix These recommendations should be included in the EMP

[x] For example, if the development is likely to have irreversible negative impacts on the conservation status of a species.

[xi] When considering cumulative impacts the distribution, spatial requirements and population dynamics of potentially affected priority species should be considered, together with the likelihood of impacts from other proposed developments occurring.

[xii] A copy of these guidelines is available at http://www.birdlife.org.za/conservation/birds-and-wind-energy and www.ewt.org.za. A list of a list of avian specialists who have agreed to follow the best practice guidelines is also available from these websites.

BirdLife South Africa

Position Statement on Wind Energy and Biodiversity Offsets

BirdLife South Africa supports the responsible development of wind energy in South Africa. Wind energy can, however, impact on birds by causing loss of habitat, disturbance and/or mortality through collisions with the wind turbines and associated transmission infrastructure. Where negative impacts on avifauna are anticipated, biodiversity offsets are sometimes proposed as a solution. Biodiversity offsets are "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken*"[1]. The aim of biodiversity offsets is to achieve no net loss (or a gain) of biodiversity on the ground.

Biodiversity offsets, in the context of birds and wind energy in South Africa, poses a number of challenges. Should biodiversity offsets be considered for a wind energy project, the following points must be noted:

The mitigation hierarchy must be followed.

Biodiversity offsets should only be considered once the 'mitigation hierarchy' has been exhausted. It must be proved that every effort has been made to prevent or avoid negative impacts, then to minimize such impacts, and only then to remedy them. Biodiversity offsets should only be considered as a last resort and in exceptional circumstances.

Following the mitigation hierarchy may require the consideration of alternative sites.

There are a numerous sites available for the development of wind energy in South Africa. BirdLife South Africa is therefore of the opinion that consideration of alternative sites is a critical part of the mitigation hierarchy. BirdLife South Africa will most likely request the consideration of alternative sites prior to any agreement on a biodiversity offset.

[1] Business and Biodiversity Offsets Programme (BBOP). 2013. To No Net Loss and Beyond: An Overview of the Business and Biodiversity Offsets Programme (BBOP), Washington, D.C.
Available from www.forest-trends.org/biodiversityoffsetprogram/guidelines/Overview_II.pdf.

Biodiversity offsets require a clear understanding of the impacts.

In order to identify an appropriate offset, it is important to have a clear understanding of what the potential residual impacts on bird life will be. Wind energy is new to South Africa and understanding of the impacts on birds is thereof still in its infancy. While predicting and quantifying direct habitat loss from development is relatively simple, predicting and quantifying the displacement of birds at wind farms remains challenging. Similarly, any predictions relating to the number of mortalities as a result of collisions are likely to be inaccurate. BirdLife South Africa therefore suggests that these limitations must be recognised while identifying an appropriate offset and a precautionary approach should be adopted.

We suggest further that, given the high levels of uncertainty, a flexible approach to mitigation and offsets may be required throughout the lifecycle of the project. If unanticipated negative impacts occur, it may be necessary to consider voluntary offsets as a last resort should additional mitigation measures not prove to be effective (this would fall outside of the environmental authorisation process).

Biodiversity offsets can impose a substantial burden on stakeholders.

Biodiversity offsets can be complicated and time consuming for all stakeholders involved. For example, they may require complicated legal and financial agreements, additional studies, and on-going monitoring and review. When considering whether a biodiversity offset is appropriate and desirable, the indirect costs to all stakeholders should be considered.

Biodiversity offsets should address the impact ("like for like" or better).

Biodiversity offsets should be designed to address the residual negative impacts on the habitat or species (or suite of species) concerned. For example, if a particular habitat is lost and this loss is predicted to be of moderate to high significance, a similar habitat, or ideally better habitat, should be conserved. If the residual negative impact is mortality, the proposed offset should clearly demonstrate that it will compensate for these losses by maintaining the status of the population in question. Conservation actions that do not address a particular threat to the species or habitat in question should not be considered an appropriate offset.

Offsets should be for the duration of the impact.

Biodiversity offsets should, at the minimum, be applicable for the duration of the impact. This could be limited to the lifespan of the facility (assuming the impacts are immediately reversible once the activity ceases), but could require conservation action in perpetuity (in the case of irreversible habitat loss). In such a case, the required conservation action should remain the responsibility of the holder of the environmental authorisation.

Knock-on effects of the offset must be considered.

When considering the desirability of an offset, consideration should be given to whether the proposed conservation actions could have knock-on impacts on the ecosystems. In most instances it will not be considered desirable to artificially manipulate the natural environment.

Offsets cannot compensate for irreversible impacts of very high negative significance.

BirdLife South Africa will not support a proposed wind farm that is predicted to have irreversible negative impacts of high to very high negative significance on birdlife. In such instances we are of the opinion that the proposed development should not be approved and biodiversity offsets are not appropriate and should not be considered.

Summary

BirdLife South Africa suggests that biodiversity offsets should only be considered in exceptional circumstances. We will not support a proposed biodiversity offset unless we are convinced that the mitigation hierarchy has been followed and there are no suitable alternatives. We will also not support a biodiversity offset unless it can be clearly demonstrated that the offset will result in restoring, or improving the status of the species or habitats in question.

September 2013

BirdLife South Africa & the Endangered Wildlife Trust

Position statement on wind farms and birds

- BirdLife South Africa (BLSA) and the Endangered Wildlife Trust (EWT) acknowledge the demand for energy from efficient renewable sources, and the associated environmental and climate change considerations. Large scale wind power is currently the most advanced of these and is more frequently available as a renewable source of energy at an apparently economically viable cost.

- There is remarkable global evidence from scientific studies (in for example England, Spain and USA) that wind turbines can be hazardous to birds and their habitats. Specifically, wind turbines can cause three major problems for birds:
    1. Disturbance (scaring birds away from their roosting, nesting or feeding sites).
    2. Loss or damage to bird habitat.
    3. Collision with tower or blades responsible for fatalities.

- Although BLSA and EWT support wind energy as an alternative source of energy that can significantly cut greenhouse gas emissions, the EWT and BLSA only support wind farm developments where:
    1. Environmental assessments and in particular avifaunal specialist studies have been adequate according to a general standard as approved by the EWT-BLSA wind farm committee.
    2. Where Red List bird species (and other bird species considered to be of conservation importance for various reasons) and/or their habitat will not be threatened or altered.
    3. Where regional populations of birds and/or their habitat will not be negatively impacted on.
    4. Where bird species which are limited in numbers and/or in their distribution or are endemic to South Africa will not be threatened.
    5. Where the turbines/blades are not located in a major flying pathway of bird species.

- Wind farms proposed to be located in the following areas will not be supported by BLSA and EWT:

1. Inside protected areas (nature reserves, national parks, Ramsar sites) and Important Bird Areas (IBAs).
2. Inside buffer zones (the range of which is determined by the relevant species) around IBAs, nature reserves, national parks and Ramsar sites.
3. In major migration routes and especially migration bottlenecks where large numbers of birds are highly concentrated.
4. In habitats where wind farms are known to pose high collision risks to birds. Wetlands, mountain ridges and roost sites would be examples of such critical locations.

- BLSA and EWT will support only those projects with adequate environmental assessments based on sufficient information on the influence of the development on relevant birds and their habitats.
    1 All stages of the life cycle and the habitats and locations that support essential functions (including breeding, feeding, moulting, roosting, non-breeding, including migration stopovers) should be taken into account in assessments.
    2 Comprehensive Environmental Impact Assessments (EIAs) and avifaunal specialist studies undertaken for all wind farm proposed developments should include the effects of the associated infrastructure such as power lines and roads on birds.

Mvelaphande Trading

Mvelaphande Trading
44 B Mill Street
BLOEMFONTEIN
9300

Enquiries: Lehlohonolo Roestof
Telephone: 051 - 401 6256/ 0814383017
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E-mail : Roestlh5@telkom.co.za

Our reference: **CCPN0117-16**

Your reference:

29 March 2016

SIVEST
P O Box 2921
RIVONIA
2128

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

With reference to your mail dated 18/03/2016.

With reference to your above-mentioned application, I hereby inform you that our Client (Telkom SA SOC Ltd) approves the proposed work indicated on your drawings in terms Section 29 of the Electronic Communications Act 36 of 2005 as amended.

Any changes/deviations from the original planning during or prior to construction must immediately be communicated to this office.

Approval is granted, subject to the following conditions, as per attached drawings supplied, our Client's (Telkom SA SOC Ltd) overhead infrastructure will be affected as indicated in GREEN. Our Client (Telkom SA SOC Ltd) infrastructure must be regarded as approximate only. Consequently, the following conditions apply:

Aerial Plant - At points of crossing, the overhead power lines should cross above the communications lines in accordance with and clearances stipulated in the Occupational Health and safety Act no 85 of 1993, Machinery regulations 20 – Crossings, and Electrical machinery Regulations 15 – Clearance of Power Lines. If the specifications could not be met, all deviation costs will be for the applicant's account. We also refer to section 25 of Electronic Communication Act 36 of 2005.

At points of crossing, the overhead power line should cross over the overhead communication lines with a minimum vertical separation of **0.6** meters.

Suitable protection as laid down in section 5 of the Code of Practice should be provided at all important crossings.

The crossing of supply lines or overhead service mains directly above or adjacent to communication poles must be avoided if possible. If not clearance of **3** meters must be provided.

In order to minimize noise induction into the telecommunication systems, the angle of crossing between the overhead power line and all communication lines, should be as near to a right angle as possible – the following deviation from the right angle being permitted at:

- Power voltage of lower than 48 kV - 45 degrees

Paragraph 2.4.1 of the Code of Practice stipulates the minimum acceptable horizontal separation between power and the communication lines and where this cannot be met, the design of the power line is also stipulated. This could apply between the attached plans and these requirements should strictly be adhered to.

Approved on condition that, should it later be found necessary to deviate the existing communication line due to existing noise interference or any other reason whatsoever, the cost of such remedial action shall be repayable.

Relocations of our Client (Telkom SA SOC Ltd) plant will be done at customer's request and will be a repayable project.

Please notify the office within 21 working days from date of this letter of acceptance and if any alternative proposal is available of if a recoverable work should commence, the liaison officer is **Lehlohonolo Roestof** at tel. no. **051 – 401 6256.**

As important cables are affected, **Mr Vivian Groenewald must be contacted at 054 338 6501/081 362 6738 two weeks prior of commencement on construction work. It would be appreciated if this office can be notified within 30 days on completion of construction work.** Confirmation is required on completion of construction as per agreed requirements.

On completion of this project please certify that all requirements as stipulated in this letter have been met. Please note that should any of our Client (Telkom SA SOC Ltd) infrastructure has to be relocated or altered as a result of your activities the cost for such alterations or relocations will be for your account in terms of section 25 of the Electronic Communications Act.

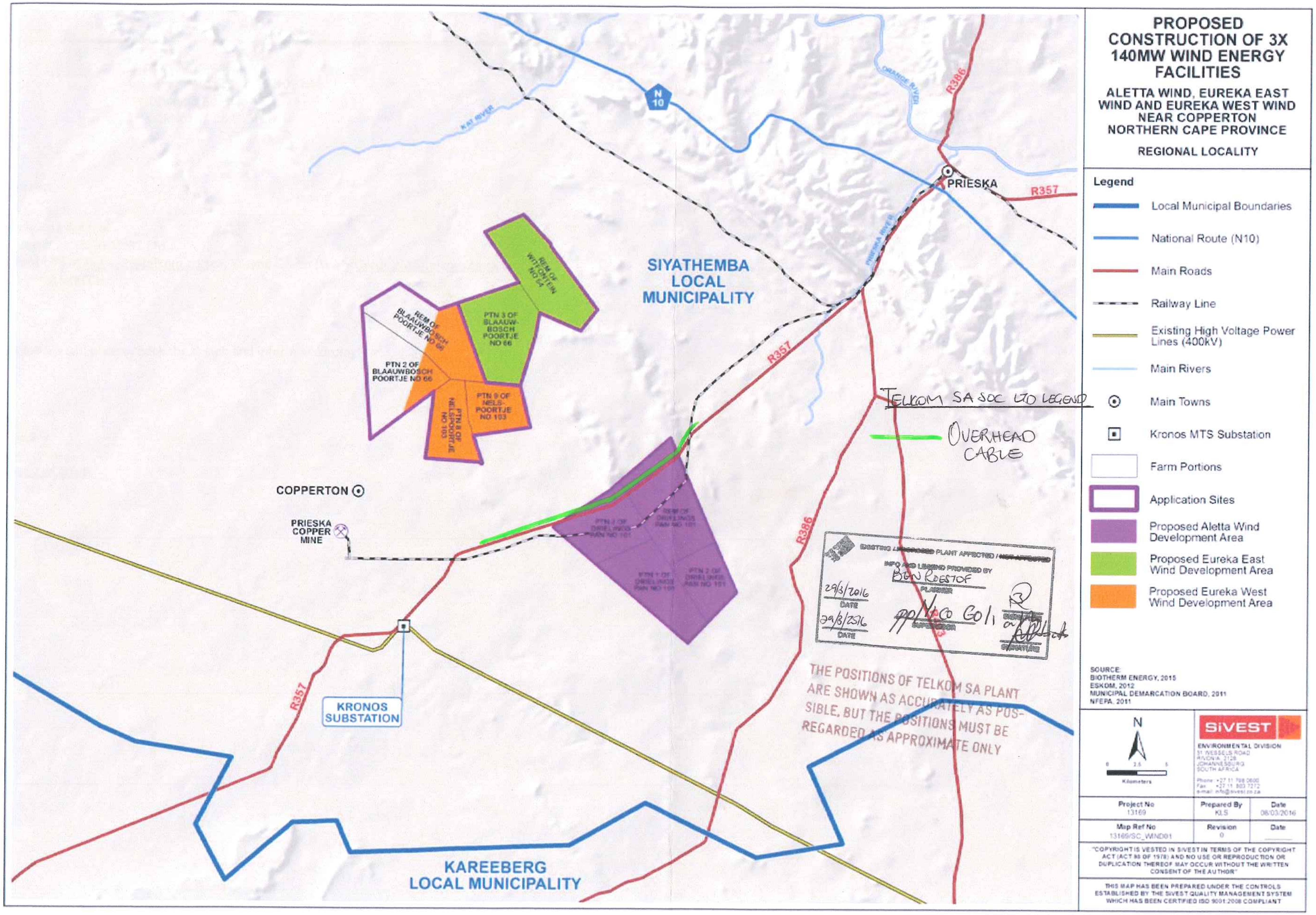
Should our Client (Telkom SA SOC Ltd) infrastructure be damaged while work is undertaken, kindly call the Toll free number **0800203951** immediately

All of our Client (Telkom SA SOC Ltd) rights remain reserved.

Mr Vivian Groenewald must be contacted at 054 338 6501/081 362 6738 before any commencement of work.

Yours faithfully

L Roestof



Figuur 1: Liggingskaart

Lynsey Rimbault

From:	Hlengiwe Ntuli
Sent:	29 March 2016 12:08
To:	Lynsey Rimbault; Rebecca Thomas; nicolenev@zitholele.co.za
Subject:	FW: CCPN0117-16 EUREKA EAST, EUREKA WEST AND ALETTA WIND ENERGY FACILITIES
Attachments:	CCPN0117-16 COVER LETTER.pdf; CCPN0117-16 UPDATED SKETCH.pdf

FYA

Kind Regards,

Hlengiwe Ntuli
Projects Secretary
SiVEST Environmental & Civils Divisions

SiVEST is a Level 3 BBBEE Contributor

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Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

From: Lehlohonolo Roestof (LB) [mailto:RoestLB5@telkom.co.za]
Sent: 29 March 2016 11:54 AM
To: Hlengiwe Ntuli <HlengiweN@sivest.co.za>
Cc: Vivian Groenewald (VR) <GroeneVR@telkom.co.za>
Subject: CCPN0117-16 EUREKA EAST, EUREKA WEST AND ALETTA WIND ENERGY FACILITIES

Good day

Approval is granted, subject to the following conditions, as per attached drawings supplied, our Client's (Telkom SA SOC Ltd) overhead infrastructure will be affected as indicated in GREEN. Our Client (Telkom SA SOC Ltd) infrastructure must be regarded as approximate only.

Mr Vivian Groenewald must be contacted at 054 338 6501/081 362 6738 before any commencement of work.

Regards,

Ben Roestof
Mvelaphanda Trading
Roestlb5@telkom.co.za
051 401 6256/081 438 3017

Lynsey Rimbault

From:	Hlengiwe Ntuli
Sent:	04 April 2016 11:47
To:	Lynsey Rimbault
Subject:	FW: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process
Attachments:	13169_Eureka and Aletta_BID_Rev 1_8March2016 (Afrikaans).pdf; 13169_Eureka and Aletta_BID_Rev 1_8March2016_LR.PDF; 13169_Eureka and Aletta_ Invite Letter_Rev 1_08Mar2016 (Afrikaans).pdf; 13169_Eureka and Aletta_ Invite Letter_Rev 1_08Mar2016_RT.PDF; 13169_Eureka and Aletta_Draft BID Reg Comm Form_Rev 1_8March2016_LR AFR.PDF; 13169_Eureka and Aletta_Draft BID Reg Comm Form_Rev 1_8March2016_RT.PDF

FYI

Kind Regards,

Hlengiwe Ntuli
Projects Secretary
SiVEST Environmental & Civils Divisions

SiVEST is a Level 3 BBBEE Contributor

Direct +27 11 798 0690 **Tel** +27 11 798 0600 **fax** +27 11 803 7272
email HlengiweN@sivest.co.za **website** www.sivest.co.za

Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

From: Nicole Abrahams (WR) [mailto:AbrahamsN@nra.co.za]
Sent: 04 April 2016 11:36 AM
To: Hlengiwe Ntuli <HlengiweN@sivest.co.za>
Cc: Colene Runkel (WR) <Runkelc@nra.co.za>; René de Kock (WR) <Dekockr@nra.co.za>; Garth Julius (WR) <JuliusG@nra.co.za>; Imelda Julies (WR) <Juliesi@nra.co.za>
Subject: FW: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

Good day H Ntuli

The above project bears reference.

I would herewith like to register as IAP for this project. May I request that you please forward SANRAL a copy of your transport plan, and note that prior to the actual transportation of any equipment relating to the WEF kindly notify SANRAL in writing, should you use any of the National Roads during the transportation.

The transport plan can be sent to: Garth Julius or Imelda Julies

JuliusG@nra.co.za
JuliesI@nra.co.za

Regards

	Ms Nicole Abrahams **Environmental Coordinator** Tel: 021 957 4602 Cell : 062 215 8945 Fax: 021 910 1699 Email: Abrahamsn@nra.co.za
Reg.No. 1998/009584/30	Sanral **Western Region** 1 Havenga Street, Oakdale, 7530 Private Bag X19, Bellville, 7535 www.sanral.co.za SANRAL Fraud Hotline: 0800204558

From: Hlengiwe Ntuli [mailto:HlengiweN@sivest.co.za
Sent: 18 March 2016 05:15 PM
Cc: Andrea Gibb <AndreaG@sivest.co.za>; nicolenev@zitholele.co.za; Lynsey Rimbault <LynseyR@sivest.co.za>
Subject: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

******* Please note that this email was sent from a NO REPLY email address. Please do not reply to this address as it is an unmonitored email account. *******

Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

• EUREKA EAST WEF – DEA Ref No: To be announced
• EUREKA WEST WEF – DEA Ref No: To be announced
• ALETTA WEF – DEA Ref No: To be announced
• EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced
• ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced

• INVITATION TO PARTICIPATE IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of the EIA Regulations and the National Environmental Management Act, 1998 (Act No. 107 of 1998), SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) has been appointed as the independent Environmental Assessment Practitioner (EAP) by BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) to conduct the EIA processes for the proposed development of the Eureka East, Eureka West and Aletta 140MW WEFs, and the BA processes for the two (2) associated substations and 132kV power lines. The proposed projects are located in the Northern Cape Province near Copperton.

SiVEST would like to invite you, as a potential Interested and/or Affected Party (I&AP), to become actively involved in the EIA and Public Participation Process (PPP) for this proposed project. The aim of this process is as follows:

♣ to ensure that all the relevant environmental impacts are taken into consideration;
♣ to ensure public input; and
♣ provide decision-makers with sufficient information to make an informed decision on the proposed activities.

Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.
****
Geagte Belangstellende en/of Geaffekteerde Party

OMGEWINGSIMPAKEVALUERINGS (OIE's) EN OMGEWINGSBESTUURSPROGRAMME (OBPR'e)
VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA's), EN BASIESE EVALUERINGS (BE's) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

• EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word
• EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word
• ALETTA WKA – DO Verw. No.: Moet aangekondig word
• EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word
• ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word

• UITNODIGING OM DEELNAME AAN DIE OMGEWINGSIMPAKEVALUERINGSPROSES

Ingevolge die OIE-regulasies en die Nasionale Wet op Omgewingsbestuur, 1998 (Wet 107 van 1998), is SiVEST SA (Edms.) Bpk. (hierna SiVEST genoem) deur BioTherm Energy (Edms.) Bpk. (hierna BioTherm genoem) aangestel as die onafhanklike Omgewingsevalueringspraktisyn (OEP) ten einde die OIE-prosesse vir die beoogde ontwikkeling van die Eureka-Oos, Eureka-Wes en Aletta 140 MW WKA's en die BE-prosesse vir die twee (2) gepaardgaande substasies en 132 kV kraglyne te onderneem. Die beoogde projekte is naby Copperton in die Noord-Kaapprovinsie geleë.

SiVEST nooi u, as 'n potensiële Belangstellende en/of Geaffekteerde Party (B&GP), om aktief by die OIE en Openbare Deelnameproses (ODP) vir hierdie beoogde projek betrokke te raak.

Die doel van hierdie proses is om:
♣ toe te sien dat al die tersaaklike omgewingsimpakte in ag geneem word;
♣ openbare insette te verseker; en
♣ besluitnemers van voldoende inligting te voorsien ten einde 'n ingeligte besluit oor die beoogde aktiwiteite te neem.

Aangeheg is die Agtergrondinligtingsdokument (AID) wat inligting rakende die beoogde projek, asook die beoogde OIE BE en ODP bevat.

Deur die meegaande registrasie- en kommentaarvorm in te vul en in te dien, sal u as ’n B&GP op die projek se databasis geregistreer word.

Ons bedank u by voorbaat dat u deel word van die Openbare Deelnameproses en ons sien daarna uit om u waardevolle insette betreffende die beoogde projek te ontvang.

Die uwe

Andrea Gibb (B.Sc. Landscape Architecture; B.Sc.(Hons) Environmental Management) Environmental Practitioner and Visual Specialist SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

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Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Directorate: Forestry Management (Other Regions)
P.O. Box 2782, Upington, 8800, Tel 054 338 5909, Fax 054 334 0030

Enquiries: J Mans
E-mail: JacolineMa@daff.gov.za
Date: 20 April 2016
Ref: **F40.8.14.2/NC/20**

SIVEST Environmental
P.O. Box 2129
RIVONIA
2128

EMAIL: andreag@sivest.co.za/ lynseyr@sivest.co.za

RE: COMMENTS ON BACKGROUND INFORMATION DOCUMENT (BID) OF THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEF), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE (DEA REF: TO BE ANNOUNCED)

1. DEPARTMENTAL MANDATE

The Directorate: Forestry Management (Other Regions) in the National Department of Agriculture, **Forestry** and Fisheries (DAFF) is responsible for implementation of the **National Forests Act, Act 84 of 1998 (NFA) and the National Veld and Forest Fires Act, Act 101 of 1998** as amended. The developer must take note of the following sections of the NFA:

1.1 Section 12(1): "The Minister may declare-
- (a) a particular tree,
- (b) a particular group of trees,
- (c) a particular woodland; or
- (d) trees belonging to a particular species, to be a protected tree, group of trees, woodland or species.

1.2 Section 15(1): "No person may-
- (a) Cut, disturb, damage or destroy any protected tree; or
- (b) Possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except-
  - (i) under a license granted by the Minister; or
  - (ii) in terms of an exemption from the provision of this subsection published by the Minister in the Gazette on the advice of the Council."

J.M.

1.3 Section 62(2)(c): "Any person who contravenes the prohibition on-

(i) The cutting, disturbance, damage or destruction of temporarily protected trees or groups of trees referred to in section 14(2) or protected trees referred to in section 15(1)(a); or

(ii) The possession, collection, removal, transport, export, purchase or sale of temporarily protected trees or groups of trees referred to in section 14(2) or protected trees referred to in section 15(1)(b), or any forest product derived from a temporarily protected tree, group of trees or protected tree, is guilty of a first category offence.

1.4 Section 58 (1): "Any person who is guilty of a first category offence referred to in sections 62 and 63 may be sentenced to a fine or imprisonment for a period of up to three years, or to both a fine and such imprisonment."

1.5 The list of protected tree species under section 12(1) (d) of the National Forests Act, 1998 (Act No. 84 of 1998) was published in GN1161 of 20 November 2015.

2. COMMENTS ON BACKGROUND INFORMATION DOCUMENT (BID)

2.1 The proposed project is located approximately 6km north east of Copperton. The 3x 140 MW Wind Energy Facilities (WEF) will cover the following areas: The Eureka East WEF has an area of 6950 ha, Eureka West WEF has an area of 6118 ha and Alette WEF has an area of 11002 ha. The impacts on NFA listed protected trees should be assessed (if any) and avoided as far as possible.

2.2 The proposed developments will also need a Flora Permit from the DENC for destruction of common indigenous, protected or specially protected plant species under the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA). Also assess potential impacts TOPS or CITES listed plant species.

2.3 Please ensure that the developer applies for and obtain a valid Forest Act License prior to disturbance of protected trees. The Forest Act License application must be submitted to the DAFF after obtaining an Environmental Authorisation and Preferred Bidder Status, but at least 3 months prior to construction to allow sufficient time for processing of the license.

Kind Regards,

J.Mans

Jacoline Mans
Chief Forester: NFA Regulation

DEPT. VAN LANDBOU, BOSBOU & VISSERY
NORTHERN CAPE REGION
2016 -04- 20
PO BOX 2782, UPINGTON 8800
TEL: 054 338 5908/09/10 FAX: 054 334 0030
DEPT. OF AGRICULTURE, FORESTRY & FISHERIES

Eskom	SCOT	Technology

Title:	**Renewable Energy Generation Plant Setbacks to Eskom Infrastructure**	Unique Identifier:	**240-65559775**
		Alternative Reference Number:	**N/A**
		Area of Applicability:	**Power Line Engineering**
		Documentation Type:	**Guideline**
		Revision:	**0**
		Total Pages:	**8**
		Next Review Date:	**N/A**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	**Approved by**	**Authorised by**
....	....	....
J W Chetty	**V Naidoo**	**R A Vajeth**
Mechanical Engineer	**Chief Engineer (Lines)**	**Acting Snr Manager (Lines)**
Date: 20/02/2014	Date: 24/02/2014	Date: 27/2/2014

Supported by SCOT/SC

....

R Vajeth

SCOT/SC/ Chairperson

Date: 27/2/2014

PCM Reference: 240-65132732 **LINE ENGINEERING SERVICES**

SCOT Study Committee Number/Name : **OVERHEAD LINES**

CONTENTS

FIGURES

EXECUTIVE SUMMARY

In recent decades, the use of wind turbines, concentrated solar plants and photovoltaic plants have been on the increase as it serves as an abundant source of energy. This document specifies setbacks for wind turbines and the reasons for these setbacks from infrastructure as well as setbacks for concentrated solar plants and photovoltaic plants. Setbacks for wind turbines employed in other countries were compared and a general setback to be used by Eskom was suggested for use with wind turbines and other renewable energy generation plants.

1. INTRODUCTION

During the last few decades, a large amount of wind turbines have been installed in wind farms to accommodate for the large demand of energy and depleting fossil fuels. Wind is one of the most abundant sources of renewable energy. Wind turbines harness the energy of this renewable resource for integration in electricity networks. The extraction of wind energy is its primary function and thus the aerodynamics of the wind turbine is important. There are many different types of wind turbines which will all exhibit different wind flow characteristics. The most common wind turbine used commercially is the Horizontal Axis Wind Turbine. Wind flow characteristics of this turbine are important to analyse as it may have an effect on surrounding infrastructure.

Wind turbines also cause large turbulence downwind that may affect existing infrastructure. Debris or parts of the turbine blade, in the case of a failure, may be tossed behind the turbine and may lead to damage of infrastructure in the wake path.

This document outlines the minimum distances that need to be introduced between a wind turbine and Eskom infrastructure to ensure that debris and / or turbulence would not negatively impact on the infrastructure.

Safety distances of wind turbines from other structures as implemented by other countries were also considered and the reasons for their selection were noted.

Concentrated solar plants and photovoltaic plants setbacks away from substations were also to be considered to prevent restricting possible power line access routes to the substation.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document provides guidance on the safe distance that a wind turbine should be located from any Eskom power line or substation. The document specifies setback distances for transmission lines (220 kV to 765 kV), distribution lines (6.6 kV to 132 kV) and all Eskom substations. Setbacks for concentrated solar plants and photovoltaic plants are also specified away from substations.

2.1.1 Purpose

Setbacks for wind turbines and power lines / substations are required for various reasons. These include possible catastrophic failure of the turbine blade that may release fragments and which may be thrown onto nearby power lines that may result in damage with associated unplanned outages. Turbulence behind the turbine may affect helicopter flight during routine Eskom live line maintenance and inspections that may lead to safety risk of the aircraft / personnel. Concentrated solar plants and photovoltaic plants setback away from substations were required to prevent substations from being boxed in by these renewable generation plants limiting line route access to the substations.

2.1.2 Applicability

This document is applicable to the siting of all new and existing wind turbines, concentrated solar plants and photovoltaic plants near power lines and substations.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

1. http://www.envir.ee/orb.aw/class=file/action=preview/id=1170403/Hiiumaa+turbulence+impact+EMD.pdf.
2. http://www.energy.ca.gov/2005publications/CEC-500-2005-184/CEC-500-2005-184.PDF
3. http://www.adamscountywind.com/Revised%20Site/Windmills/Adams%20County%20Ordinance/Adams%20County%20Wind%20Ord.htm
4. http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA11R&RE=1&EE=1
5. http://www.wind-watch.org/documents/european-setbacks-minimum-distance-between-wind-turbines-and-habitations/
6. http://www.publications.parliament.uk/pa/ld201011/ldbills/017/11017.1-i.html
7. http://www.caw.ca/assets/pdf/Turbine_Safety_Report.pdf
8. Rogers J, Slegers N, Costello M. (2011) A method for defining wind turbine setback standards. Wind energy 10.1002/we.468

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Setback	The minimum distance between a wind turbine and boundary line/dwelling/road/infrastructure/servitude etc.
Flicker	Effect caused when rotating wind turbine blades periodically cast shadows
Tip Height	The total height of the wind turbine ie. Hub height plus half rotor diameter (see Figure1)

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
None	

2.5 ROLES AND RESPONSIBILITIES

All personnel involved in the positioning wind turbines, concentrated solar plants and photovoltaic plants near power lines/substations must follow the setbacks outlined in this guideline.

2.6 PROCESS FOR MONITORING

Approval by Eskom in writing.

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. DOCUMENT CONTENT

3.1 INTERNATIONAL SETBACK COMPARISON

Wind Turbine setbacks employed by various countries were considered. It was found that setbacks were determined for various reasons that include noise, flicker, turbine blade failure and wind effects. The distances (setbacks) varied based on these factors and were influenced by the type of infrastructure

Wind turbine setbacks varied for roads, power lines, dwellings, buildings and property and it was noted that the largest setbacks were employed for reasons of noise and flicker related issues [1-7]. Very few countries specified setbacks for power lines.

The literature survey [1-7], yielded information about studies and experiments were conducted to determine the distance that a broken fragment from a wind turbine might be thrown. Even though of low probability of hitting a power line [$5.0x10^{-5}$ [8]], the distances recorded were significant [750m [8]]

Setbacks were thus introduced to prevent any damage to Eskom infrastructure.

Wind turbines may also cause changes in wind patterns with turbulent effects behind the hub. These actors dictate the wind turbine setbacks specified in this document.

Concentrated solar plants and photovoltaic plants also can limit access into the substation for power lines of all voltages. A setback distance must therefore be employed to prevent the substation from being boxed in by these generation plants. These setback distances are specified in this document.

3.2 ESKOM REQUIRED SETBACKS

- Eskom requires a setback distance of 3 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for transmission lines.
- Eskom requires a setback distance of 1 times the tip height of the wind turbine from the edge of the closest Eskom servitude (including vacant servitudes) for distribution Lines.
- Eskom must be informed of any proposed wind turbine, concentrated solar plants and photovoltaic activity within a 5 km radius of a substation. No wind turbine structure shall be built within a 2 km radius of the closest point of the substation. Where concentrated solar plants and photovoltaic structures fall within a 2 km radius of the closest point of a substation, Eskom should be informed in writing during the planning phase of the construction of such plant or structure.
- Applicants must show that Eskom radio telecommunication systems (mainly microwave systems) will not be affected in any way by wind turbines.

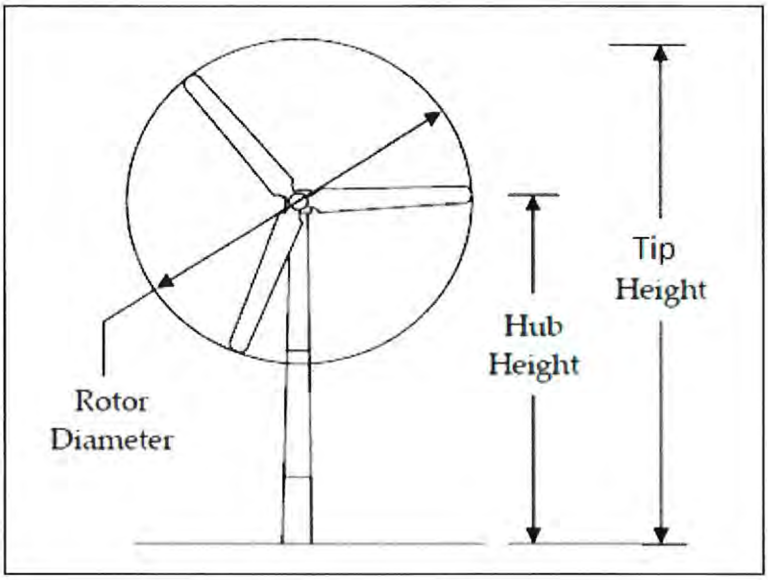

Figure 1: Horizontal Axis Wind Turbine [2]

4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
V Naidoo	Chief Engineer
Dr P H Pretorius	Electrical Specialist
J Geeringh	Snr Consultant Environ Mngt
B Haridass	Snr Consultant Engineer
R A Vajeth	Acting Snr Manager (Lines)

5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2013	0	J W Chetty	First Publication - No renewable energy generation plant setback specification in existence

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

Jonathan W Chetty (Mechanical Engineer)

Vivendhra Naidoo (Chief Engineer)

Dr Pieter H Pretorius (Electrical Specialist)

John Geeringh (Snr Consultant Environ Mngt)

Bharat Haridass (Snr Consultant Engineer)

Riaz A Vajeth (Acting Snr Manager (Lines))

Eskom requirements for work at or near Eskom infrastructure.

1. Eskom's rights and services must be acknowledged and respected at all times.

2. Eskom shall at all times retain unobstructed access to and egress from its servitudes.

3. Eskom's consent does not relieve the developer from obtaining the necessary statutory, land owner or municipal approvals.

4. Any cost incurred by Eskom as a result of non-compliance to any relevant environmental legislation will be charged to the developer.

5. If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the developer's activities or because of the presence of his equipment or installation within the servitude restriction area, the developer shall pay such costs to Eskom on demand.

6. The use of explosives of any type within 500 metres of Eskom's services shall only occur with Eskom's previous written permission. If such permission is granted the developer must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.

7. Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's satisfaction.

8. Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the developer, his/her agent, contractors, employees, successors in title, and assignees. The developer indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or otherwise. Eskom will not be held responsible for damage to the developer's equipment.

9. No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the developer must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager

   Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

10. Eskom’s rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with.

11. Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom’s satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.

12. The clearances between Eskom’s live electrical equipment and the proposed construction work shall be observed as stipulated by *Regulation 15* of the *Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).*

13. Equipment shall be regarded electrically live and therefore dangerous at all times.

14. In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as an additional safety precaution, Eskom will not approve the erection of houses, or structures occupied or frequented by human beings, under the power lines or within the servitude restriction area.

15. Eskom may stipulate any additional requirements to highlight any possible exposure to Customers or Public to coming into contact or be exposed to any dangers of Eskom plant.

16. It is required of the developer to familiarise himself with all safety hazards related to Electrical plant.

17. Any third party servitudes encroaching on Eskom servitudes shall be registered against Eskom’s title deed at the developer’s own cost. If such a servitude is brought into being, its existence should be endorsed on the Eskom servitude deed concerned, while the third party’s servitude deed must also include the rights of the affected Eskom servitude.

John Geeringh (Pr Sci Nat)

Senior Consultant Environmental Management
Eskom GC: Land Development

Hlengiwe Ntuli

From:	John Geeringh <GeerinJH@eskom.co.za>
Sent:	13 May 2016 03:24 PM
To:	Hlengiwe Ntuli
Subject:	RE: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process
Attachments:	Eskom requirements for work in or near Eskom servitudes WIND (3).doc; Renewable Energy Generation Plant Setbacks to Eskom Infrastructure - Signed.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Please find attached Eskom requirements for works at or near Eskom infrastructure, Please send me KMZ files of land parcels, line routes and other layouts when available.

Kind regards

John Geeringh (Pr Sci Nat)
Senior Consultant Environmental Management

Eskom GC: Land Development
Megawatt Park
D1Y39
P O Box 1091
Johannesburg
2000

Tel: 011 516 7233
Fax: 086 661 4064
Cell: 083 632 7663

From: Hlengiwe Ntuli [mailto:HlengiweN@sivest.co.za]
Sent: 18 March 2016 05:15 PM
Cc: Andrea Gibb; nicolenev@zitholele.co.za; Lynsey Rimbault
Subject: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

******* Please note that this email was sent from a NO REPLY email address. Please do not reply to this address as it is an unmonitored email account. *******

Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

• EUREKA EAST WEF – DEA Ref No: To be announced
• EUREKA WEST WEF – DEA Ref No: To be announced
• ALETTA WEF – DEA Ref No: To be announced
• EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced

• ALETTA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced

• INVITATION TO PARTICIPATE IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of the EIA Regulations and the National Environmental Management Act, 1998 (Act No. 107 of 1998), SiVEST SA (Pty) Ltd (hereafter referred to as SiVEST) has been appointed as the independent Environmental Assessment Practitioner (EAP) by BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) to conduct the EIA processes for the proposed development of the Eureka East, Eureka West and Aletta 140MW WEFs, and the BA processes for the two (2) associated substations and 132kV power lines. The proposed projects are located in the Northern Cape Province near Copperton.

SiVEST would like to invite you, as a potential Interested and/or Affected Party (I&AP), to become actively involved in the EIA and Public Participation Process (PPP) for this proposed project. The aim of this process is as follows:

♣ to ensure that all the relevant environmental impacts are taken into consideration;
♣ to ensure public input; and
♣ provide decision-makers with sufficient information to make an informed decision on the proposed activities.

Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.
****
Geagte Belangstellende en/of Geaffekteerde Party

OMGEWINGSIMPAKEVALUERINGS (OIE’s) EN OMGEWINGSBESTUURSPROGRAMME (OBPR’e)
VIR DIE BEOOGDE ONTWIKKELING VAN DIE EUREKA-OOS, EUREKA-WES EN ALETTA 140 MW WINDKRAGAANLEGTE (WKA’s), EN BASIESE EVALUERINGS (BE’s) VIR DIE TWEE (2) GEPAARDGAANDE SUBSTASIES EN 132 KV KRAGLYNE NABY COPPERTON, NOORD-KAAPPROVINSIE

• EUREKA-OOS WKA – DO Verw. No.: Moet aangekondig word
• EUREKA-WES WKA – DO Verw. No.: Moet aangekondig word
• ALETTA WKA – DO Verw. No.: Moet aangekondig word
• EUREKA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word
• ALETTA 132 KV SUBSTASIE EN KRAGLYN – DO Verw. No.: Moet aangekondig word

• UITNODIGING OM DEELNAME AAN DIE OMGEWINGSIMPAKEVALUERINGSPROSES

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SiVEST nooi u, as ’n potensiële Belangstellende en/of Geaffekteerde Party (B&GP), om aktief by die OIE en Openbare Deelnameproses (ODP) vir hierdie beoogde projek betrokke te raak.

Die doel van hierdie proses is om:
♣ toe te sien dat al die tersaaklike omgewingsimpakte in ag geneem word;
♣ openbare insette te verseker; en
♣ besluitnemers van voldoende inligting te voorsien ten einde ’n ingeligte besluit oor die beoogde aktiwiteite te neem.

Aangeheg is die Agtergrondinligtingsdokument (AID) wat inligting rakende die beoogde projek, asook die beoogde OIE BE en ODP bevat.

Deur die meegaande registrasie- en kommentaarvorm in te vul en in te dien, sal u as ’n B&GP op die projek se databasis geregistreer word.

Ons bedank u by voorbaat dat u deel word van die Openbare Deelnameproses en ons sien daarna uit om u waardevolle insette betreffende die beoogde projek te ontvang.

Die uwe

Andrea Gibb (B.Sc. Landscape Architecture; B.Sc.(Hons) Environmental Management) Environmental Practitioner and Visual Specialist SiVEST Environmental Division

SiVEST is a Level 3 BBBEE Contributor

Direct +27 11 798 0638 Tel +27 11 798 0600 fax +27 11 803 7272 cell +27 72 587 6525 email andreag@sivest.co.za website www.sivest.co.za

Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

Lynsey Rimbault

From:	Lynsey Rimbault
Sent:	16 May 2016 09:24
To:	'GeerinJH@eskom.co.za'
Cc:	Hlengiwe Ntuli
Subject:	RE: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process
Attachments:	13169_EurekaWind_23Nov2015.kml; 13169_AlettaWind_24Nov2015.kml

Dear Mr Geeringh,

Please see attached the site boundary kmls for the Eureka and Aletta projects. More detailed layouts will be available with the DSRs. You will be notified when these are available.

Kind Regards
Lynsey

From: John Geeringh [mailto:GeerinJH@eskom.co.za]
Sent: 13 May 2016 03:24 PM
To: Hlengiwe Ntuli <HlengiweN@sivest.co.za>
Subject: RE: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

Please find attached Eskom requirements for works at or near Eskom infrastructure, Please send me KMZ files of land parcels, line routes and other layouts when available.

Kind regards

John Geeringh (Pr Sci Nat)
Senior Consultant Environmental Management

Eskom GC: Land Development
Megawatt Park
D1Y39
P O Box 1091
Johannesburg
2000

Tel: 011 516 7233
Fax: 086 661 4064
Cell: 083 632 7663

From: Hlengiwe Ntuli [mailto:HlengiweN@sivest.co.za]
Sent: 18 March 2016 05:15 PM
Cc: Andrea Gibb; nicolenev@zitholele.co.za; Lynsey Rimbault
Subject: Eureka East, Eureka West and Aletta Wind Energy Facilities: Invitation to Participate in the EIA Process

******* Please note that this email was sent from a NO REPLY email address. Please do not reply to this address as it is an unmonitored email account. *******

Dear Interested and/or Affected Party,

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

• EUREKA EAST WEF – DEA Ref No: To be announced
• EUREKA WEST WEF – DEA Ref No: To be announced
• ALETTA WEF – DEA Ref No: To be announced
• EUREKA 132KV SUBSTATION AND POWER LINE – DEA Ref No: To be announced
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♣ to ensure that all the relevant environmental impacts are taken into consideration;
♣ to ensure public input; and
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Attached is the Background Information Document (BID) which contains information regarding the proposed project as well as the EIA, BA and PPP.

By completing and submitting the accompanying registration and comment form, you will be registered as an I&AP on the project database.

We would like to thank you, in advance, for becoming part of the Public Participation Process and are looking forward to receiving your valuable comments relating to the proposed project.
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Die uwe

Andrea Gibb (B.Sc. Landscape Architecture; B.Sc.(Hons) Environmental Management) Environmental Practitioner and Visual Specialist SiVEST Environmental Division

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Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

www.eskom.co.za/idm

Lynsey Rimbault

From: Hlengiwe Ntuli
Sent: 18 March 2016 11:52
To: 'Aletta De Jager'
Subject: RE: Aletta WKA 140MV

Good Day Aletta,

Thank you for your interest.
I've added you on our database and you should receive communication regarding the project going forth.

Kind Regards,

Hlengiwe Ntuli
Projects Secretary
SiVEST Environmental & Civils Divisions

SiVEST is a Level 3 BBBEE Contributor

Direct +27 11 798 0690 Tel +27 11 798 0600 fax +27 11 803 7272
email HlengiweN@sivest.co.za website www.sivest.co.za

Consulting Engineers - Project Managers - Environmental Consultants - Town and Regional Planners
Durban - Johannesburg - Pietermaritzburg - Richards Bay - Ladysmith - Cape Town - Harare (Zimbabwe)

-----Original Message-----
From: Aletta De Jager [mailto:alettadj@gmail.com]
Sent: 18 March 2016 11:45 AM
To: Andrea Gibb <AndreaG@sivest.co.za>; Hlengiwe Ntuli <HlengiweN@sivest.co.za>
Subject: Aletta WKA 140MV

Dear Sir/Madam

I would like to receive all relevant information relating the development Aletta WKA near Prieska. Please add me to the list of members involved with the farm.

Kind regards
Aletta de jager
083 266 5239

Lynsey Rimbault

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Sent: 18 March 2016 11:52
To: 'Aletta De Jager'
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083 266 5239

Appendix 7E

Comments and Response Report

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

COMMENTS AND RESPONSES REPORT – DRAFT SCOPING REPORT

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

SUMMARY OF ENVIRONMENTAL ISSUES/CONCERNS AND SUGGESTIONS RAISED BY INTERESTED AND/OR AFFECTED PARTIES (I&APS)

MARCH – JUNE 2016

Stakeholders who contributed issues ranging across all sectors of society are recorded in this Comments and Responses Report (C&RR). Full record of every issue raised is available from the public participation office and is also included in Appendix 7D of the Draft Scoping Report. Similar issues raised have been grouped together. The name, affiliation and date of the commentator are also indicated. Technical comments made by the project team are not included in the C&RR.

INDEX TO ISSUES IN THIS TABLE

ABBREVIATIONS

ATNS	Air Traffic Navigation Services
BID	Background Information Document
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAFF	Department of Agriculture Forestry and Fisheries
DEIAr	Draft Environmental Impact Assessment Report
DENC	Department of Environment and Nature Conservation
DSR	Draft Scoping Report
ECP	Emission Control Plan
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
FEIAr	Final Environmental Impact Assessment Report
FSR	Final Scoping Report
ITC	Interference Testing and Consultancy Services
NFA	National Forests Act
SANRAL	South African National Roads Agency Limited
SKA	Square Kilometre Array
TOPS	Threatened or Protected Species

Issue/Comment	Raised By	Response
1. Surrounding Infrastructure Related Comments/Issues		
Upon receipt of the topographical analyses report compiled by MESA Solutions and the path loss and risk assessment report compiled by Interference Testing and Consultancy Services (ITC) the Square Kilometre Array (SKA) had the following comments: I. Both reports indicated that significant amount of mitigation would be required; II. Given the calculated path loss between the proposed facility and the nearest SKA station, a requirement on the emissions of the wind facility is specified at between 10dB and 20dB below CISPR-22 Class B emission limits. However, such a threshold is a specified requirement, but does not give any indication of the required mitigation to reach this level; III. The extent of the required mitigation is not fully established. However, previous measurements on similar types of facilities, the cumulative impact of multiple turbines as well as other multiple facilities in the area, suggests that in order to meet the required threshold levels, extensive and detailed mitigation would be required. There is no guarantee that the required level of mitigation would be technically possible; IV. Based on the above, this facility remains a high risk to the SKA. Detailed emission measurements and EMC control plans, which provide sufficient evidence and proof of the determined mitigation required and that it is technically achievable, would warrant a review of this risk rating. They concluded that given the current risk and information available, the South Africa SKA Project Office does not support the development of this wind energy facility.	Adrian Tiplady SKA Email: 18 March 2016	Following receipt of the comments from the SKA, BioTherm implemented the following to help alleviate potential impacts: ○ Reduced the number of turbines from 80 to 60. ○ Moved the turbines 25km from the nearest phase 2 SKA station. BioTherm then proposed to redo the studies undertaken by ITC based on these changes, this is currently being done. Additionally, ITC informed BioTherm that they are doing additional measurements with Acciona and will be compiling an Emissions Control Plan with mitigations. ITC will be updating the risk assessment based on the new layout and will compile an Emission Control Plan (ECP) based on the work done with Acciona. Following completion of the additional studies, BioTherm will engage with the SKA again, and SKA comments will be included in the Draft Environmental Impact Assessment Report (DEIAr). Furthermore, the SKA will be provided with an opportunity to comment on the Draft Scoping Report (DSR), and any comments received will be included in the Final Scoping Report (FSR) or DEIAr. ***Lynsey Rimbault, SiVEST***
Air Traffic Navigation Services (ATNS) acknowledged receipt of the Background Information Document (BID) and requested additional technical information.	Simphiwe Masilela ATNS Email: 22 March 2016	The comments from ATNS are noted, the technical information was not available during the scoping phase when it was requested, these will be provided as they become available. All relevant technical details will be provided to ATNS prior to the start of construction. ***Lynsey Rimbault, SiVEST***

Issue/Comment	Raised By	Response
Mr Roestof indicated that Telkom approves the proposed project, but that any changes prior to or during construction must be communicated to their office. Approval was granted provided that the conditions supplied by Telkom are adhered to. The conditions stipulated by Telkom are included in Appendix 7D.	Lehlohonolo Roestof Mvelaphande Trading On behalf of Vivian Groenewald Telkom Email: 29 March 2016	The comments from Telkom are noted, and they will continue to be kept informed as the project progresses. All relevant technical details will be provided to Telkom prior to the start of construction. The conditions stipulated by Telkom will be provided to BioTherm Energy. ***Lynsey Rimbault, SiVEST***
The South African National Roads Agency Limited (SANRAL) requested that they be registered on the project database. It was also requested that a copy of the transport plan be provided to SANRAL. Ms Abrahams commented that prior to any transportation of equipment related to the project, SANRAL should be notified in writing.	Nicole Abrahams SANRAL Email: 4 April 2016	The transportation plan will be compiled following completion of the EIA, but prior to the start of construction. The request by SANRAL has been forwarded to BioTherm Energy and they will provide SANRAL with the transportation plan once it is complete. ***Lynsey Rimbault, SiVEST***
Eskom provided their requirements for work at or near Eskom infrastructure. For full details of the requirements, refer to Appendix 7D. They also requested KMZ files of land parcels, line routes and other layouts when available.	John Geeringh Eskom GC: Land Development Email: 13 May 2016	Eskom's requirements will be included in the Environmental Management Programme (EMPr) to ensure that any development at or near Eskom infrastructure will adhere to the prescribed requirements. Mr Geeringh was provided with the site boundary kmls for the Aletta project and informed that more detailed layouts will be available within the DSR. He will be notified when these are available. ***Lynsey Rimbault, SiVEST***
2. Communication Related Comments/Issues		
Ms de Jager requested that she be included in the project database, and that she receives all relevant information relating to the development of the Aletta wind energy facility.	Aletta de Jager Landowner Email: 18 March 2016	Ms de Jager will remain registered on the project database and will continue to receive all project related information. ***Lynsey Rimbault, SiVEST***
3. Biodiversity Related Comments/Issues		
BirdLife acknowledged receipt of the project information and requested that BirdLife be registered on the project database. They also provided the BirdLife assessment guidelines for wind energy facilities. For full details of the guidelines, refer to Appendix 7D.	Simon Gear BirdLife Email: 22 March 2016	BirdLife will remain registered on the project database and will continue to receive all project notifications. The assessment guidelines for wind energy facilities have been forwarded to the avifaunal specialist and will be complied with. ***Lynsey Rimbault, SiVEST***
Ms Mans highlighted sections of the National Veld and Forest Fires Act, Act 101 of 1998 as amended. These include sections 12(1), 15(1), 62(2)(c), and 58(1). She also mentioned the list of protected tree species which is included in section 12(1)(d) of the National Forests Act (NFA), 1998. The Department of Agriculture Forestry and Fisheries (DAFF) comments on the BID include:	Jacoline Mans DAFF 20 April 2016	The DAFFs comments are noted. The biodiversity specialist scoping report has assessed the impact of the proposed project on protected trees, common indigenous, protected or specially protected plant species, as well as TOPS and CITES listed plant species. The impacts of these will be further assessed in the EIA phase biodiversity specialist report, and all required permits and/or mitigation measures will be

Issue/Comment	Raised By	Response
I. The impacts on the NFA list of protected trees should be assessed (if any) and avoided as far as possible. II. The proposed developments will need a Flora Permit from the Department of Environment and Nature Conservation (DENC) for the destruction of common indigenous, protected or specially protected plant species under the Northern Cape Nature Conservation Act. An assessment must also be done for potential impacts on Threatened or Protected Species (TOPS) or Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listed plant species. III. The developer must apply for and obtain a valid Forest Act License prior to disturbance of protected trees. The application for this must be submitted to the DAFF after obtaining Environmental Authorisation and Preferred Bidder Status, but at least three months prior to construction to allow for sufficient time for processing of the license.		stipulated in the Final Environmental Impact Assessment Report (FEIAr) and Environmental Management Programme (EMPr). The developer will be informed that a Flora Permit from the Department of Environment and Nature Conservation (DENC) will be required for the destruction of common indigenous, protected or specially protected plant species and a valid Forest Act License must be obtained prior to any disturbance of protected trees, this will also be stipulated in the EMPr. ***Lynsey Rimbault, SiVEST***

Appendix 7F
I&AP Database

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE		
SCOPING PHASE I&AP DATABASE JUNE 2016		
First Name	**Last Name**	**Company**
Abe	Abrahams	DWA
Abrie	Smit	
Adriaan	Tiplady	Square Kilometre Array
Albertus	Vermeulen	Plaas: Jonkerwater
Aletta	De Jager	Remainder of Drielings Pan No 101
Alexia	Hlengani	Department of Water and Sanitation
Amanda	Bester	Telkom (SA) Ltd
Andrew	Timothy	SAHRA (Northern Cape)
Anna	Pretorius	Siyathemba Local Municipality
Beatrice	Mondzinger	Siyathemba Local Municipality
Ben Lehlohonolo	Roestof	Mvelaphanda Trading
Betty	Titus	Siyathemba Local Municipality
Bradley	Gibbons	EWT: African Crane Conservation Programme
Brian	Fisher	Dept of Environment and Nature Conservation
Carolyn	Ah Shene-Verdoorn	Birdlife South Africa
Danie & Jomima	Bernard	FARM: KLIPGATS PAN
Danster	Muggel	Siyathemba Local Municipality
David	Phike	Siyathemba Local Municipality
Dawid	Louw	Siyathemba Local Municipality
Dirk	van Wyk	Loretha Trust
Elizabeth	Martin	Siyathemba Local Municipality
Ernest	Kubayi	Department of Water and Sanitation (Upington)
Ertjies	Taljaart	Eskom: Distribution (Prieska)
Ester	Makungo	Department of Water and Sanitation
Evert	Burger	Plase: Witfontein & Blaauwbosch Poortje
F M	Van Wyk	Siyathemba Local Municipality
F.M.	Van Wyk	Siyathemba Local Municipality
Felicity	Bostander	Siyathemba Local Municipality
Ferlicia	Ward	Air Traffic Navigation Services
Frank	Andreas	Siyathemba Local Municipality
Frans	van Wyk	Gemeend Trust
Garth	Julius	SANRAL
George	Plaatjies	Siyathemba Local Municipality
Gerhard	Van Wyk	Plase: Bosjesmansberg & Blaauwbosch Poortje
Gert	Steenkamp	NC Department of Agriculture, Land Reform and Rural Development
Giel	MacDonald	Siyathemba Local Municipality
Gloria	Speelman	Siyathemba Local Municipality
Gregory	MacKay	Siyathemba Local Municipality
Heleen	van den Heever	Telkom (SA) Ltd
Henning	Myburg	Agri SA: Northern Cape

Hettie	Buys	Department of Agriculture, Forestry and Fisheries
Hettie	Morobisi	Siyathemba Local Municipality
Howard	Tsume	Siyathemba Local Municipality
Imelda	Julies	SANRAL
IWJ	Stadhouer	Siyathemba Local Municipality
Jack	Maccollan	Pixley Ka Seme District Municipality
Jaco	Roelofse	NC Department of Roads & Public Works
Jacoline	Mans	Department of Agriculture, Forestry & Fisheries
Jakob	Basson	Siyathemba Local Municipality
Jan Johannes	Basie	Siyathemba Local Municipality
Jane	Molepo	Siyathemba Local Municipality
Jasper	Nieuwoudt	Deparment of Mineral Resources
Johan	Badenhorst	Siyathemba Local Municipality
Johan	Koegelenberg	SENTECH
Johanna	Morobane	Air Traffic Navigation Services
Johannes	Van Wyk	Plaas: Uitzigt
John	Geeringh	Eskom: Transmission
Justina	De Jager	Plaas: Drielings Pan
Katriena	Booysen	Siyathemba Local Municipality
Liena	Louw	Siyathemba Local Municipality
Likas	Steenkamp	Plaas: Jackals Water
Lizell	Stoh	SA Civil Aviation Authority
Lorenthia	Malgas	Siyathemba Local Municipality
Lorraine	Nobela	Department of Water and Sanitation
Lourens	Leeuwner	EWT
Mandisa	Yawa	Pixley Ka Seme District Municipality
Mashudu	Marubini	DAFF Provinical Department
Mashudu	Mukoma	Pixley Ka Seme District Municipality
Miriam	Kibi	Pixley Ka Seme District Municipality
Mmatlala	Rabothata	Department of Environmental Affairs
Moses	Mahunonyane	Department of Water & Sanitation
Nico	Fourie	Department of Roads & Public Works: Northern Cape Province
Nicole	Abrahams	SANRAL
Nomonde	Pieterse	Siyathemba Local Municipality
Ntsundeni	Ravhogoni	Department of Mineral Resources (DMR)
Olwethu	Tshikela	Siyathemba Local Municipality
Onwabile	Ndzumo	NC Dept of Environment and Nature Conservation
Patrick	Lenyibi	DEPARTMENT OF SPORT, ARTS & CULTURE
Piet	Papier	Siyathemba Local Municipality
Pieter	Fourie	Plaas: Nelspoortje
Pieter	Meyer	Plase: Nelspoortje & Vogelstruis Bult
Rene	De Kock	SANRAL: Western Region
Ronny	Cahi	Farm: Witfontein (Erfdeel)
Rosinia	Smit	Siyathemba Local Municipality
Roslin	Zziwa	Siyathemba Local Municipality
Sam	Diokpala	Pixley Ka Seme District Municipality

Sam	Fiff	Transnet Freight Rail (Jhb)
Sam	Kock	Siyathemba Local Municipality
Sanda	De Jager	Plase: Drielings Pan & Uitzigt
Saul	Basson	Siyathemba Local Municipality
Seoka	Lekota	Department of Environmental Affairs
Shaun	Dyers	SANRAL Western Region
Simon	Gear	Birdlife South Africa
Simphiwe	Masilela	Air Traffic Navigation Services
Sindisile	Madyo	Pixley Ka Seme District Municipality
Solman	Van Zyl	Plaas: Doonies Pan
Sonwabile	Nkondeshe	Dept of Environmental Affairs
Sonwabile	Nkondeshe	Pixley Ka Seme District Municipality
Suzanne	Erasmus	WESSA Northern Cape
Thulani	Mthombeni	NC Dept of Environment and Nature Conservation
Toni	Cahi	Farm: Witfontein (Erfdeel)
Vivian	Groenewald	Telkom SA SOC Ltd
Vivian	Maritz	Siyathemba Local Municipality
William	van Staden	Siyathemba Local Municipality
Wilson	Joko	Siyathemba Local Municipality
Wynand	Human	Farm: Plat Sjambok

Appendix 7G
Minutes of Meetings

To be included in the DEIAr

Appendix 7H
Landowner Notifications and Consent

SiVEST Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
Fax +27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

SiVEST
Established 1952

LANDOWNER CONSENT FORM

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

Property Details:	Remainder of Drielings Pan No.101
Registered Title Deed Owner	Aletta de Jager
Full name(s) & Surname of ~~Owner/Occupier/L~~egal Representative of land:	Sanda de Jager
Identification Number:	600303 0106 080 (Sister)
Postal Address:	Posbus 233 Prieska. 8940
Telephone Number:	072 484 7131 (053-353 2546)
Fax Number:	053-353 2546.
Cell Phone Number:	072 484 7131
E-mail Address:	sandadej@gmail.com
SIGNATURE	S de Jager.

LANDOWNER CONSENT FORM

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

Property Details:	Portion 1 of Drielings Pan No.101
Registered Title Deed Owner	Cornelius Jansen de Jager
Full name(s) & Surname of ~~Owner/Occupier/~~Legal Representative of land:	Executor of Estate Mrs Celetta de Jager
Identification Number:	600303 0106 080 (Daughter)
Postal Address:	Posbus 233 Prieska 8940
Telephone Number:	053 - 353 2546
Fax Number:	053 353 2546
Cell Phone Number:	072 484 7131
E-mail Address:	sandadej@gmail.com
SIGNATURE	Sd Jager

SiVEST Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
Fax +27 11 803 7272
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LANDOWNER CONSENT FORM

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

Property Details:	Portion 2 of Drielings Pan No.101
Registered Title Deed Owner	aletta de Jager
Full name(s) & Surname of ~~Owner/Occupier~~/Legal Representative of land:	Sanda de Jager
Identification Number:	SdJ ~~Posbus 233.~~ SdJ ~~Prieska~~ 600303 0106080
Postal Address:	~~8940~~ Posbus 233
	Prieska 8940
Telephone Number:	~~072 484 7131~~ SdJ 053 353 2546 ~~072 484 7131~~ SdJ
Fax Number:	053 353 2546
Cell Phone Number:	072 484 7131
E-mail Address:	sandadej@gmail.com
SIGNATURE	Sdejager.

SiVEST Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
Fax +27 11 803 7272
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www.sivest.co.za

SiVEST
Established 1952

LANDOWNER CONSENT FORM

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

Property Details:	Portion 3 of Drielings Pan No.101
Registered Title Deed Owner	Cornelius Jansen de Jager
Full name(s) & Surname of ~~Owner/Occupier~~/Legal Representative of land:	Aletta de Jager (wife) Mr De Jager passed away and Mrs Aletta de Jager is the Executor of the Estate
Identification Number:	6003030106080 (Daughter)
Postal Address:	Posbus 233 Prieska 8940
Telephone Number:	053- 353 2546.
Fax Number:	053 353 2546.
Cell Phone Number:	072 4847131
E-mail Address:	sandadej@gmail.com.
SIGNATURE	SdeJager.

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) AND ENVIRONMENTAL MANAGEMENT PROGRAMMES (EMPrs) FOR THE PROPOSED DEVELOPMENT OF THE EUREKA EAST, EUREKA WEST AND ALETTA 140MW WIND ENERGY FACILITIES (WEFs), AND BASIC ASSESSMENTS (BAs) FOR THE TWO (2) ASSOCIATED SUBSTATIONS AND 132kV POWER LINES NEAR COPPERTON, NORTHERN CAPE PROVINCE

LANDOWNER VISITATION AND CONSULTATION REGISTER: 10 - 11 MARCH 2016

FARM NAME / PLAAS NAAM	FARM / PLAAS NO	PTN / GED NO	NAME / NAAM	SURNAME / VAN	PROPERTY REGISTERED AS / EIENDOM GEREGISTREER AS	REGISTERED OWNER or OCCUPIER / GEREGISTREERDE EIENAAR of BEWONER	POSTAL ADDRESS / POSADRES	TELEPHONE / TELEFOON	FAX / FAKS	CELL/ SEL	EMAIL / EPOS	DATE OF VISIT / DATUM VAN BESOEK	SIGNATURE / HANDTEKENING
			Frans	van Wyk			Posbus 544	0832508617	–	0832508617	witfonteinfrans@gmail.com	10/03/2016	
			Sanda	de Jager			Posbus 233 Prieska.	072 4847131		072 484 7131	sandadej@gmail.com	10/03/2016	
			GERHARD	VAN WYK							gerhardvanwyk@lantic.net	10/03/2016	
			TONY	CAHI							tonyjerfdeel@gmail.com	10/03/2016	
			DIRK. v WYK	VAN WYK							VANWYKDIRK62@GMAIL.COM	10/03/2016	

Appendix 7I
Distribution to Organs of State

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY (WEF), AND BASIC ASSESSMENT (BA) FOR THE ASSOCIATED SUBSTATION AND 132kV POWER LINE NEAR COPPERTON, NORTHERN CAPE PROVINCE

DISTRIBUTION OF THE DRAFT SCOPING REPORT (DSR) TO ORGANS OF STATE FOR COMMENT

TITLE	SURNAME	NAME	POSITION	POSTAL ADDRESS	EMAIL ADDRESS
SIYATHEMBA LOCAL MUNICIPALITY					
Mr	Basson	Jakob	LED Manager	PO Box 16 PRIESKA 8940	jakob@siyathemba.gov.za
Mr	Tshikela	Olwethu	Environmental Health Practitioner	PO Box 16 PRIESKA 8940	tshikelaolwethu@gmail.com
PIXLEY KA SEME DISTRICT MUNICIPALITY					
Mr	Nkondeshe	Sonwabile	Senior Environmental Officer	Private Bag X1012 DE AAR 7000	snkondeshe@environment.gov.za
Mr	Madyo	Sindisile	LED Manager	Private Bag X1012 DE AAR 7000	excellentsolutions@live.co.za
DEPARTMENT OF ENVIRONMENTAL AFFAIRS BIODIVERSITY					
Mr	Lekota	Seoka		Private Bag X447 Pretoria 0001	slekota@environment.gov.za
Mr	Rabothata	Mmatlala		Private Bag X447 Pretoria 0001	slekotamrabothata@environment.gov.
AGRI SA-NORTHERN CAPE					
Mr	Myburg	Henning	General Manager	PO Box 1094 KIMBERLEY 8300	henning@agrink.co.za
DEPARTMENT OF WATER AND SANITATION					
Ms	Makungo	Ester	Environmental Officer	Private Bag X6101 KIMBERLEY 8300	makungoe@dws.gov.za
Mr	Mahunonyane	Moses	Director: Institutional Establishment	Private Bag X6101 KIMBERLEY 8300	MahunonyaneM@dws.gov.za
NORTHERN CAPE DEPARTMENT OF AGRICULTURE, LAND REFORM & RURAL DEVELOPMENT					
Mr	Steenkamp	Gert		P.O.Box 65 CALVINIA 8190	gsteenkamp@ncpg.gov.za
DEAPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES					
Northern Cape Department					
Ms	Mans	Jacoline	Chief Forester	Koelenhof 306 Schroder Street UPINGTON, 8800	jacolinema@daff.gov.za
Provincial Department					
Ms	Buys	Hettie	Senior Registry Clerk	Private Bag X120 PRETORIA 0001	hettieb@daff.gov.za
DEPARTMENT OF MINERAL RESOURCES (DMR)					
Mr	Ravhogoni	Ntsundeni	Regional Manager	Private Bag x6093 KIMBERLEY 8300	Ntsundeni.Ravhogoni@dmr.gov.za
NORTHERN CAPE DEPT OF ENVIRONMENT AND NATURE CONSERVATION					
Mr	Fisher	Brian	Director Environmental Impact Management	Private Bag X86102 KIMBERLEY 8300	bfisher@ncpg.gov.za

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY (WEF), AND BASIC ASSESSMENT (BA) FOR THE ASSOCIATED SUBSTATION AND 132kV POWER LINE NEAR COPPERTON, NORTHERN CAPE PROVINCE					
DISTRIBUTION OF THE DRAFT SCOPING REPORT (DSR) TO ORGANS OF STATE FOR COMMENT					
TITLE	**SURNAME**	**NAME**	**POSITION**	**POSTAL ADDRESS**	**EMAIL ADDRESS**
Mr	Mthombeni	Thulani		Private Bag X86102 KIMBERLEY 8300	tmtho@webmail.co.za
NORTHERN CAPE DEPT OF SPORT, ARTS & CULTURE: Heritage Resources Unit					
Mr	Lenyibi	Patrick	Manager: Heritage Resources	Private Bag X5004 KIMBERLEY 8300	plenyibi@ncpg.gov.za
SANRAL - WESTERN REGION					
Ms	Abrahams	Nicole	Environmental Coordinator	Private Bag X19 BELLVILLE 7535	abrahamsn@nra.co.za
NORTHERN CAPE DEPARTMENT OF ROADS AND PUBLIC WORKS					
Mr	Roelofse	Jaco	Director: Planning & Design	PO Box 3132 Kimberley 8300	roelofse.j@vodamail.co.za
SAHRA: HEAD OFFICE					
Ms	Lavin	Jenna	Heritage Officer: Northern Cape	PO Box 4637 CAPE TOWN 8000	jlavin@sahra.org.za
ESKOM					
Mr	Geeringh	John	Chief Planner	PO Box 1091 JOHANNESBURG 2000	GeerinJH@eskom.co.za
SQUARE KILOMETRE ARRAY					
Dr	Tiplady	Adriaan	Manager: Site Categorisation	PO Box 522 SAXONWOLD 2132	atiplady@ska.ac.za
SA CIVIL AVIATION AUTHORITY (SA CAA)					
Ms	Stoh	Lizell	Obstacle Specialist	Private Bag X73 HALFWAY HOUSE 1685	strohl@caa.co.za
AIR TRAFFIC AND NAVIGATION SERVICES (ATNS)					
Ms	Morobane	Johanna	Manager: Corporate Sustainability and Environment	Private Bag X15 KEMPTON PARK 1620	JohannaM@atns.co.za
Ms	Masilela	Simphiwe	Obstacle Evaluator	Private Bag X15 KEMPTON PARK 1620	SimphiweM@atns.co.za
TRANSNET FREIGHT RAIL					
Mr	Fiff	Sam	Environmental Manager: Freight Rail	PO Box 255 BLOEMFONTEIN 9300	sam.fiff@transnet.net
SENTECH					
Mr	Koegelenberg	Johan	Renewable Projects	Private Bag X06 Honeydew 2040	koegelenbergj@sentech.co.za
TELKOM					
Mr	Bester	Amanda	Wayleave Officer	Private Bag X20700 BLOEMFONTEIN 9300	WayleaCR@telkom.co.za BesterAD@telkom.co.za
Ms	van den Heever	Heleen	Ops Manager Central Region	Private Bag X20700 BLOEMFONTEIN 9300	vdheevhd@telkom.co.za
ENDANGERED WILDLIFE TRUST					
Mr	Gibbons	Bradley	African Crane Conservation Programme	PO Box 40 MIDDELBURG 5900	bradleyg@ewt.org.za

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE PROPOSED DEVELOPMENT OF THE ALETTA 140MW WIND ENERGY FACILITY (WEF), AND BASIC ASSESSMENT (BA) FOR THE ASSOCIATED SUBSTATION AND 132kV POWER LINE NEAR COPPERTON, NORTHERN CAPE PROVINCE					
DISTRIBUTION OF THE DRAFT SCOPING REPORT (DSR) TO ORGANS OF STATE FOR COMMENT					
TITLE	**SURNAME**	**NAME**	**POSITION**	**POSTAL ADDRESS**	**EMAIL ADDRESS**
WESSA - NORTHERN CAPE					
Ms	Visagie	Ronelle	EIA Coordinator, Wildlife and Energy Programme	PO Box 91 STRYDENBURG 8765	ronellev@ewt.org.za
Ms	Erasmus	Suzanne	EIA Coordinator, Wildlife and Energy Programme	PO Box 316 KIMBERLEY 8300	info@wessa.co.za wessanc@yahoo.com
BIRDLIFE SOUTH AFRICA					
Mr	Gear	Simon	Policy and Advocacy Manager	PO Box 515 RANDBURG 2125	advocacy@birdlife.org.za

Appendix 8
Additional Information

Appendix 8A

Project Coordinates

ALETTA WIND: APPLICATION SITE & DEVELOPMENT AREA

CORNER POINT COORDINATES

POINT	**SOUTH**	**EAST**
A_01 (NW)	S29° 52' 51.794"	E22° 32' 27.848"
A_02 (NE)	S29° 59' 52.858"	E22° 35' 30.970"
A_03 (SE)	S30° 2' 11.890"	E22° 33' 19.076"
A_04 (SW)	S29° 56' 56.872"	E22° 27' 9.065"

AREA: 11002.728ha

Appendix 8B
Title Deeds

Walker, Malherbe, Godley & Field

16448

AKTEKANTOOR, KAAPSTAD.
DEEDS REGISTRY, CAPE TOWN.
13 -7- 1971
REGISTRATEUR VAN AKTES

VERBAND
MORTGAGE
10-11-1959
CANCELLED
GEKANSELLEER
28 -9- 1972
REGISTRATEUR
REGISTRAR

1365

16448

Transportakte

Kragtens 'n Prokurasie

D. P. DE KLERK & VAN GEND
Prokureurs, Notarisse, Aktebesorgers en Parlementêre Agente.
Volkskas-gebou,
Adderleystraat,
KAAPSTAD.

Opgestel deur

Aktebesorger.

Sy dit bekend aan wie dit mag aangaan

Dat [illegible] voor my, Registrateur van Aktes, te Kaapstad, verskyn het, behoorlik daartoe gemagtig kragtens 'n Prokurasie onderteken te [illegible]

op die [illegible] dag van [illegible] 19[illegible]
deur

1. [illegible], gebore op [illegible] 19[illegible], vrygesellin,
2. [illegible], gebore op [illegible] April 19[illegible], vrygesellin

– [illegible] –

watter Prokurasie in die teenwoordigheid van getuie volgens wet onderteken, hede aan my getoon is; en die Komparant het verklaar dat [illegible] vermelde [illegible] verkoop [illegible] die [illegible] vermelde [illegible];

[illegible] vermeld

2.

1. CORNELIUS JANSEN DE JAGER, gebore op 5 Junie 1928;

2. ALETTA DE JAGER, gebore Vermeulen op 11 Januarie 1932, gehuud buite gemeenskap van goedere met CORNELIUS JANSEN DE JAGER

- in gelyke aandele -

- BEIDE BLANKE GROEP -

hul Erfgename, Eksekuteure, Administrateure of Gemagtigdes.

SEKERE VRYGEKOOPTE ERFPAGGROND, geleë in die Afdeling van Prieska, synde Gedeelte 3 ('n gedeelte van Groot Pen) van die plaas Drielings Pan, oorgedra aan Jacobus Hendrik Vermeulen kragtens Verdelingstransportakte Nr. 3571 gedateer 8 Mei 1935 en tans besit deur Komparant se Prinsipale kragtens Verdelingstransportakte Nr. 13858 gedateer 26 September 1958;

GROOT: DRIEDUISEND desimaal NUL NUL EEN TWEE (3000.0012) Morg.

SOOS vollediger sal blyk uit die aangehegte Kaart Nr. 5570/58.

ONDERHEWIG aan sodanige voorwaardes waarna verwys word in gemelde Verdelingstransportakte Nr. 3571/1935.

[...]OOTTE VAN BINNEGEMELDE EIENDOM
[...]ENT OF THE WITHINMENTIONED PROP.
IN METRIEKE MAT[...] IS
[...]ONVERTED TO M[...]
2.5770
[...]R VAN AKTES.
[...]AR OF DEEDS.
1971

WESHALWE
[...]D HIERIN BESKRYWE
[...]D DESCRIBED HEREIN
[...]ISTREER EN MOET IN DIE TOEKOMS BE-
[...]TERED AS, AND MUST IN FUTURE BE
[...]WORD AS
[...]D AS
[...]TOOR,
[...]GISTRY,
[...]TAD,
[...]TOWN.
1972
HOOF REGISTRASIEAMPTENAAR,
CHIEF REGISTRATION OFFICER.

4 3

Weshalwe die Komparant afstand gedoen het van alle eiendoms- en ander regte wat die gesegde TRANSPORTGEEFSTERS tot op hede op gemelde vaste eiendom gehad het en gevolglik ook erken het dat hul daarvan heeltemal onteien is, en geen eiendoms- en ander regte daarop besit nie; en dat, kragtens hierdie Akte, die gesegde TRANSPORTONTVANGERS hul Erfgename, Eksekuteure, Administrateure of Gemagtigdes tans is en voortaan op die volle eiendomsregte daarop geregtig sal wees, ooreenkomstig plaaslike gebruik; onder voorbehoud nogtans van die Regte van die Regering; en eindelik erken het dat die hele koopskat die som van VYFTIENDUISEND POND (£15,000.0.0.) bedra.

Ten Getuie waarvan ek, die gesegde Registrateur van Aktes, tesame met die Komparant, q.q., hierdie Akte onderteken en met die Ampseël laat bekragtig het.

Aldus verrig ten kantore van die Registrateur van Aktes, te Kaapstad, Kaap die Goeie Hoop, op die dag van die Maand in die jaar Neëntienhonderd AG EN VYFTIG (1958).

q.q. sy Prinsipaal/ale

In my teenwoordigheid

Registrateur van Aktes.

Geregistreer in die register van Nuwe Plaas Prieska

Boek 88 A (1) Folio

...Not. Akte No. 271/1972 [illegible]

[illegible]

... die figuur ABCDEFGHJKL ... Kaart No. ...

... Not. Akte.

KANTOOR,
...PSTAD.
REGISTRY,
... TOWN. 13 -6- 1972

REGISTRATEUR VAN AKTES

4.

ENDORSEMENT ON T16448 / 1958

EIENDOM/PROPERTY Ged. 3('n ged. van ged. 1) van die plaas Drielings Pan Nr. 101.

Aandeel C. J. de Jager. + Borgverband t.o.v. Aandeel van MAE. A de Jager

32050 / 1976

BC 38250/85

VERBIND / MORTGAGED 29-12-1976

GEKANSELLEER / CANCELLED

R 75000.00 en/AND.

R 7500.00

REGISTRATEUR / REGISTRAR

1985-11-28

Borgverband Aandeel. A de Jager.

76. MAE

R 75000.00 en

R 7500.00

IN ERROR

FOR FURTHER ENDORSEMENTS SEE / VIR VERDERE ENDOSSEMENTE SIEN

Vir verdere endossemente sien / For further endorsements see

6 E   T16448/58

Die oorspronklike hiervan verskyn op die aktekantoor af-skrif

ENDORSEMENT IN TERMS OF SECTION 31 (6) OF ACT 47 OF 1937
(AS AMENDED)

ENDOSSEMENT KRAGTENS ARTIKEL 31 (6) VAN WET 47 VAN 1937
(SOOS GEWYSIG)

'n Gedeelte van   groot ± 26,06 Ha
The herein-mentioned property
Die eiendom hierin vermeld...

'n has been expropriated by Spoorwegadministrasie..
is onteien deur die...

in terms of § 3(1) van Wet 37 van 1955
kragtens...

Vide Notice of expropriation No. 346/73 d.d. 16.3.1973
Vide onteieningskennisgewing No...

filed as exprop. caveat Ex346/73 plans filed in
geliasseer as onteienings caveat...pllanne in tweevoud

duplicate
geliasseer...

29/03/1973   C C Smit
....

DEEDS OFFICE
AKTEKANTOOR
CAPE TOWN/KAAPSTAD

REGISTRAR OF DEEDS
REGISTRATEUR VAN AKTES

ENDOSSEMENT I.T.V. § 3(1)(V) VAN WET 47/37

KRAGTENS § 3(7) VAN WET 47/1937 IS EX346/73 (SIEN HIERBO) NOU GEROJEER
AANSOEK GELIASSEER
BY BC

023615/2002

2002-04-23

REGISTRATEUR

JAN S. DE VILLIERS EN SEUN, KAAPSTAD.

22268

DIE GROOTTE VAN BINNEGEMELDE EIENDOM
THE EXTENT OF THE WITHINMENTIONED PROP
OMSKEP IN METRIEKE MATE IS
CONVERTED TO METRIC MEASURES IS
HEKTAAR/METERS
HECTARE(S)/METRES
REGISTRATEUR VAN AKTES
REGISTRAR OF DEEDS.

DIE GROND HIERIN BESKRYWE
THE LAND DESCRIBED HEREIN
IS GEREGISTREER EN MOET IN DIE TOEKOMS BESKRYWE WORD AS
IS REGISTERED AND MUST IN FUTURE BE DESCRIBED AS
AKTEKANTOOR, DEEDS REGISTRY, KAAPSTAD, CAPE TOWN.
HOOF REGISTRASIEAMPTENAAR
CHIEF REGISTRATION OFFICER.

AKTEKANTOOR, KAAPSTAD. 13-7-1971
DEEDS REGISTRY, CAPE TOWN.
REGISTRATEUR VAN AKTES

22268

TRANSPORTAKTE

GRP/AleR. 1394

Opgestel deur my
Transportbesorger.

(UIT KRAG VAN 'N PROKURASIE)

Hierby word bekend gemaak

Dat EDGAR DRYDEN TUDHOPE (Transportbesorger) voor my, Registrateur van Aktes, Kaapstad, verskyn het, hy die genoemde Komparant synde behoorlik daartoe gemagtig deur 'n volmag, geteken te PRIESKA op die 28ste dag van Augustus 1964 en aan hom verleen deur

1. CORNELIUS FRANS VERMEULEN, in sy hoedanigheid as die Eksekuteur Testamentêr in die boedel van wyle CORNELIUS FRANS VERMEULEN,

en

2. ANNA JUSTINA VERMEULEN, voorheen Vermeulen, gebore Marais ~~op 15 September 1896~~, 'n weduwee, in haar persoonlike hoedanigheid, wie binne gemeenskap van goedere getroud was met die genoemde oorledene gedurende sy leeftyd,

(Alsei BlankeGroep),

testament gedateer 10 Augustus 1956 van die gesegde nou wyle Cornelius Frans Vermeulen en sy nagelate eggenote Anna Justine Vermeulen, voorheen Vermeulen, gebore Marais, wie binne gemeenskap van goedere getroud was, hulle die hiernagemelde eiendomme spesiaal bemaak het aan hul dogter, die hiernagemelde transportnemer, onderhewig aan die voorwaarde dat sy maandeliks 'n bedrag van R50-00 aan die langslewende van die testateurs sal betaal, betaling waarvan behoorlik verseker is, en verder onderhewig aan die voorkoopsreg soos hierna meer volledig uiteengesit;

SO IS DIT dat hy, die gesegde Komparant, in sy voornoemde hoedanigheid, hiermee in volkome en vrye eiendom sedeer en transporteer aan en ten gunste van

ALETTA DE JAGER,
gebore Vermeulen op 11 Januarie 1932,
getroud buite gemeenskap van goedere
met Cornelius Jansen de Jager,

(Blanke Groep),

Haar Erfgename, Eksekuteurs, Administrateurs of Regverkrygendes;

1. DIE RESTANT van seker stuk vrygekoopte erfpagplaas

DRIELINGS PAN,

geleë in die Afdeling van PRIESKA;

GROOT aan restant vierduisend vierhonderd drie-en-twintig desimaal twee twee vier vier (4423.2244) morge;

UITSTREKKENDE soos die Akte van Toekenning (Victoria West Erfpagte Boekdeel 9 No.10) met 'n kaart daaraangeheg gemaak ten gunste van B.Rens op 24 Oktober 1882, en daaropvolgende Transportaktes die laaste waarvan gedateer 11 November 1938, No.11735, gemaak ten gunste van gesegde oorledene, meer volledig sal aantoon;

ONDERHEWIG aan die voorwaardes waarna verwys word in Transportakte No.11735/1938;

ONDERHEWIG VERDER, soos genoem in die voormelde gesamentlike testament gedateer 10 Augustus 1956 van gesegde nou wyle Cornelius Frans Vermeulen en sy nagelate eggenote Anna Justina Vermeulen, voorheen Vermeulen, gebore Marais, aan die voorwaarde dat die transportnemer hierbo vermeld nie hierdie eiendom aan 'n derde persoon sal verkoop of vervreem nie alvorens sy dit eers aangebied het aan haar broer Cornelius Frans Vermeulen, teen dieselfde vergoeding as wat sy van sodanige derde persoon kan ontvang nie.

2. SEKER stuk vrygekoopte erfpagplaas genoem

MERINO, gedeelte van die plaas
DRIELINGS PAN,

geleë in die Afdeling van PRIESKA;

GROOT tweeduisend en twee desimaal een nul sewe drie (2002.1073) morge;

UITSTREKKENDE soos die Transportakte met 'n kaart daaraangeheg gemaak ten gunste van C.M.Vermeulen, vrygesellin, en 'n ander, op 11 November 1938 No.11734, en daaropvolgende twee Transportaktes albei gemaak ten gunste van die gesegde oorledene, die

2016

ONDERHEWIG aan die voorwaardes waarna verwys word in Transportakte gedateer 11 November 1938, No.11734;

ONDERHEWIG VERDER, soos genoem in die voormelde gesamentlike testament gedateer 10 Augustus 1956 van die gesegde nou wyle Cornelius Frans Vermeulen en sy nagelate eggenote Anna Justina Vermeulen, voorheen Vermeulen, gebore Marais, aan die voorwaarde dat die transportnemer hierbo vermeld nie haar eiendom aan 'n derde persoon sal verkoop of vervreem nie alvorens sy dit eers aangebied het aan haar broer, Cornelius Frans Vermeulen, teen dieselfde vergoeding as wat sy van sodanige derde persoon kan ontvang nie.

187/1972

REGISTRATEUR VAN A...

27-3-1972

WESHALWE.............

932,
ere

Regverkrygendes;

rygekoopte erfpag-

i vierhonderd drie-
423.2244) morge;

van Toekenning
met 'n kaart
op 24 Oktober
laaste waarvan
ak ten gunste van
oon;

es waarna verwys

em in die voormelde
as 1956 van gesegde
nagelate eggenote
, gebore Marais,
hierbo vermeld nie
verkoop of vervreem
haar broer Cornelius
as wat sy van

gplaas genoem

plaas

simaal een nul sewe

portakte met 'n
J.L. Vermeulen,
1724.
die twee Transport-
egde oorledene, die
ander op 20
al aantoon;

1

187/1972

REGISTRATEUR VAN ...

WESHALWE

22-3-1972

KANTOOR,
KAAPSTAD.
REGISTRY,
CAPE TOWN.

2016

ONDERHEWIG aan die voorwaardes waarna verwys word in Transportakte gedateer 11 November 1938, No.11734;

ONDERHEWIG VERDER, soos genoem in die voormelde gesamentlike testament gedateer 10 Augustus 1956 van die gesegde nou wyle Cornelius Frans Vermeulen en sy nagelate eggenote Anna Justina Vermeulen, voorheen Vermeulen, gebore Marais, aan die voorwaarde dat die transportnemer hierbo vermeld nie haar eiendom aan 'n derde persoon sal verkoop of vervreem nie alvorens sy dit eers aangebied het aan haar broer, Cornelius Frans Vermeulen, teen dieselfde vergoeding as wat sy van sodanige derde persoon kan ontvang nie.

487/1972

REGISTRATEUR VAN ...

27-9-1972

WESHALWE..............

2017

ONDERHEWIG aan die voorwaardes waarna verwys word in Transportakte gedateer 11 November 1938, No.11734;

ONDERHEWIG VERDER, soos genoem in die voormelde gesamentlike testament gedateer 10 Augustus 1956 van die gesegde nou wyle Cornelius Frans Vermeulen en sy nagelate eggenote Anna Justina Vermeulen, voorheen Vermeulen, gebore Marais, aan die voorwaarde dat die transportnemer hierbo vermeld nie haar eiendom aan 'n derde persoon sal verkoop of vervreem nie alvorens sy dit eers aangebied het aan haar broer, Cornelius Frans Vermeulen, teen dieselfde vergoeding as wat sy van sodanige derde persoon kan ontvang nie.

187/1972

REGISTRATEUR VAN AKTES

27-3-1972

WESHALWE..............

2018

Weshalwe die Komparant afstand doen van al die regte en titel wat die gesegde GESAMENTLIKE BOEDEL VAN DIE GESEGDE NOU WYLE CORNELIUS FRANS VERMEULEN EN SY NAGELATE EGGENOTE ANNA JUSTINA VERMEULEN, voorheen Vermeulen, gebore Marais, voorheen

op genoemde eiendom gehad het en gevolglik ook erken dat dit geheel en al van die besit daarvan onthef en nie meer daartoe geregtig is nie, en dat, kragtens hierdie Akte bogenoemde

ALETTA DE JAGER,
gebore Vermeulen, getroud soos voormeld,

Haar Erfgename, Eksekuteurs, Administrateurs of Regverkrygendes;

tans en voortaan daartoe geregtig is, ooreenkomstig plaaslike gebruik, behoudens die regte van die Staat, en ten slotte erken hy dat die eiendom waardeer is vir boedelbelasting doeleindes teen

~~SES-EN-DERTIGDUISEND DRIEHONDERD-EN-DERTIG RAND (R36,330-00)~~

SES-EN-SESTIGDUISEND SESHONDERD VYF-EN-SEWENTIG RAND (R66,675-00)

Transport ... MIR 831/56

Ten Bewyse waarvan ek, die genoemde Registrateur van Aktes, tesame met die Komparant, q.q., hierdie Akte onderteken en met die Ampseël bekragtig het.

ALDUS GEDOEN en geteken op die Kantoor van die Registrateur van Aktes in Kaapstad, Provinsie van die Kaap die Goeie Hoop, op die Nege en twintigste (29e) Dag van die maand Oktober in die jaar van onse Heer Eenduisend Negehonderd vier-en-sestig (19 64).

(Transportbesorger)
q.q. sy Prinsipaal/ale.

In my teenwoordigheid,

ASSISTENT Registrateur van Aktes.

Geregistreer in die Register van Nuwe plaas. Prieska Boek Folio 101-par 1. 101 B. Par 2.

Klerk.

N.H.D. 24201/St.

5

T 22268 / 1964.

Restant van
die plaas Drielings Pan No. 101
et seq.

Borgverband
32050 .76
29 -12- 1976

BC 38250/85

75000,00 en/and

GEKANSELLEER
CANCELLED

[illegible]

7500,00.

REGISTRATEUR
REGISTRAR

1985 -11- 28

ONTEIENING DEUR EXPROPRIATION BY	
Republiek van Suid Afrika ne de Suid Afrikaanse Vervoerdienste	
VAN/OF Gedeelte v/d Restant v/d Plaas Drielings Pan 101	
GROOT ONGEVEER/MEASURING APPROXIMATELY	
Exp 375/1973	
30/03/1973	[illegible] REGISTRATEUR VAN AKTES

Endossement kragtens Artikel 31(7) van Wet 47/37

Kragtens Artikel 31(7) word onteiening Ex 375/73 [illegible] [illegible] [illegible] hiermee geregistreer.

[illegible] gekanselleer onder BC 023280/2002

[illegible]
[illegible]
2002 -04- 22

[illegible]
Registrateur van Aktes

171
VAN WYK GAUM FOUCHEE ING
Permgebou, Hoofstraat 345, PAARL, 7620
Posbus 362, PAARL, 7620
Tel 02211-611050
Fax 02211-24165

Opgestel deur my

TRANSPORTBESORGER
VAN WYK, W J

29/4/
9

T 27285 / 94

TRANSPORTAKTE

Hierby word bekendgemaak:

DAT

ANNECKE LOUW

voor my, Registrateur van Aktes,
verskyn het te KAAPSTAD
hy, die genoemde Komparant synde behoorlik daartoe gemagtig deur 'n volmag uitgevoer te PAARL

op die 15de dag van Maart 1994 deur

DIE TRUSTEES INDERTYD VAN DIE M.C.VIVIERS TRUST

En die Komparant het verklaar dat sy voorsegde Prinsipaal werklik en wettiglik verkoop het op 7 Februarie 1994 en dat hy, in sy voornoemde hoedanigheid hierby in volkome en vrye eiendom sedeer en transporteer aan en ten gunste van

SANDA DE JAGER
Identiteitsnommer 600303 0106 00 7
Ongetroud

Haar Erfgename, Eksekuteure, Administrateure of Gemagtigdes

DIE RESTANT VAN die plaas UITZIGT NR 69 in die Afdeling van PRIESKA;

GROOT : 3252,8119 (DRIEDUISEND TWEEHONDERD TWEE EN VYFTIG komma AGT EEN EEN NEGE) Hektaar;

AANVANKLIK GEREGISTREER kragtens Grondbrief (Prieska Erfpagte Boekdeel 1 Nr. 24) met Kaart wat daarop betrekking het en gehou kragtens Transportakte Nr. T 5115/1985.

A. ONDERHEWIG aan die voorwaardes waarna verwys word in Transportakte Nr. T 8190/1901.

B. ONDERHEWIG VERDER aan die volgende endossement bede gedateer op Transportaktes Nr. T 10556/12954 en Nr. T 4393/1959, welke endossement as volg lui:

"Kragtens Notariële Akte van serwituut Nr. 100/1973, gedateer 23 November 1971 is die eiendom hieronder gehou onderworpe aan 'n uitsluitlike reg van weg om water, gas erts of ander versendbare stowwe deur middel van 'n pyplyn te versend oor 'n strook grond 10 meter breed die roete waarvan bepaal word deur die lyn B.C.D.E.G.H.J.K.L.M.N.O.P.Q.R.S.T. wat die Noord-Westelike grens van die serwituutstreek op serwituut kaart 4G. 10149/70 daaraan geheg verteenwoordig ten gunste van Prieska Copper Mines (Pty) Ltd. onderworpe aan voorwaardes en met bykomstige regte soos meer ten volle sal bly uit die genoemde Notariële Akte."

C. ONDERHEWIG VERDER aan die endossement gedateer 7 Mei 1974 aangebring op Transportakte Nr. T 8741/1973, welke endossement soos volg lui:

"Edossement kragtens Artikel 11 (1) (b) van Wet 37 van 1956.

Die eiendom hierin vermeld - groot +- 18,62 Ha.
is deur spoorwegadministrasie onteien kragtens Artikel 3 (1) van Wet 37 van 1955.
Vide Onteieningskennisgewing Nr. 1 566/74 Ex Aansoek op 28.8.73 planne geliasseer hiermee."

P.D

[redacted]

WESHALWE die Komparant afstand doen van al die regte en titel wat bogenoemde Transportgewer Trust voorheen op genoemde eiendom gehad het, en gevolglik ook erken dat bogenoemde Transportgewer Trust geheel en al van die besit daarvan onthef en nie meer daarop geregtig is nie en dat, kragtens hierdie akte, bogenoem Transportnemer, Haar Erfgename, Eksekuteurs, Administrateurs of Regverkrygendes tans en voortaan daartoe geregtig is, oor enkomstig plaaslike gebruik, behoudens die Regte van die Staat; en ten slotte erken hy dat die hele Koopsom ten bedrae R325 281,19 (DRIEHONDERD VYF EN TWINTIGDUISEND TWEEHONDERD EEN EN TAGTIG RAND EN NEGENTIEN SENT) behoorlik betaal of verseker is.

TEN BEWYSE waarvan ek, die genoemde Registrateur, tesame met die Komparant, hierdie Akte onderteken en dit met die Ampseël bekragtig het.

ALDUS GEDOEN en verly op die Kantoor van die Registrateur van Aktes, te KAAPSTAD op hede die 25ste dag van

April

in die jaar van ons Heer, Eenduisend Negehonderd Vier en Negentig (1994)

In my teenwoordigheid

Registrateur van Aktes

q.q.

VIR ENDOSSEMENTE KYK BLADSY
FOR ENDORSEMENTS SEE PAGE

41137

Transportakte

Kragtens 'n Prokurasie

D. P. DE KLERK & VAN GEND
Prokureurs, Notarisse, Aktebesorgers
Volkskas-gebou,
Adderleystraat,
KAAPSTAD.
MP

Opgestel deur

Aktebesorger.

Wees dit bekend aan wie dit mag aangaan

Dat WILLEM PETRUS MALHERBE voor my, Registrateur van Aktes, te Kaapstad, verskyn het, behoorlik daartoe gemagtig kragtens 'n Prokurasie onderteken te PRIESKA

op die 30ste dag van September 19 76
deur

HENDRIK GIDEON HUMAN
(gebore 1 Mei 1938)
- BLANKE GROEP -

watter Prokurasie in die teenwoordigheid van getuie volgens wet onderteken, hede aan my getoon is; en die Komparant het verklaar dat sy prinsipaal werklik en wettiglik verkoop het op 22 April 1976 en dat hy die komparant in sy voornoemde hoedanigheid hiermee in volle en vrye eiendom sedeer en transporteer aan en ten gunste van:-

CORNELIUS JANSEN DE JAGER
(gebore 6 Junie 1928)

- BLANKE GROEP -

sy erfgename, eksekuteurs, administrateurs of gemagtigdes:-

SEKERE vrygekoopte erfpaggrond, geleë in die Afdeling van Prieska, synde die Restant van Gedeelte 1 (GROOT PAN) van die plaas FRIELINGS PAN NO. 101;

GROOT as sulks: 2948,1389 (Tweeduisend Negehonderd Ag en Veertig komma Een Drie Ag Nege) hektaar;

UITSTREKKENDE soos Verdelingstransportakte Nr. 3571 gedateer 8 Mei 1935, met 'n kaart Nr. A 1795/28 daarby aangeheg, gemaak ten gunste van J.H.Vermeulen en daaropvolgende aktes die laaste waarvan transportakte Nr. 16498 gedateer 24 Junie 1971, gemaak ten gunste van die komparant se prinsipaal, vollediger sal aandui;

ONDERHEWIG aan die voorwaardes waarna verwys word in Verdelingstransportakte Nr. 3571 gedateer 8 Mei 1935.

Weshalwe die Komparant afstand gedoen het van alle eiendoms- en ander regte wat die gesegde transportgewer tot op hede op gemelde vaste eiendom gehad het en gevolglik ook erken het dat hy daarvan heeltemaal ontklee is, en geen eiendoms- en ander regte daarop besit nie, en dat, kragtens hierdie Akte, die gesegde transportnemer sy Erfgename, Eksekuteurs, Administrateurs of Gemagtigdes tans is en voortaan op die volle eiendomsregte daarop geregtig sal wees, ooreenkomstig plaaslike gebruik, onder voorbehoud nogtans van die Regte van die Staat en eindelik erken het dat die koopprys die som van R93000,00 (Drie en Neëntig-duisend Rand) bedra.

Ten Getuie waarvan ek, die gesegde Registrateur van Aktes, tesame met die Komparant, q.q. hierdie Akte onderteken en met die Ampseël laat bekragtig het.

Aldus verrig ten kantore van die Registrateur van Aktes, te Kaapstad, Kaap die Goeie Hoop, op die 29 dag van die Maand Desember in die jaar Neëntienhonderd-Ses en Sewentig (1976).

q.q. sy Prinsipaal/ale

In my teenwoordigheid

Registrateur van Aktes

Geregistreer in die PLAAS register van PRIESKA

Boek Folio 101/1/2

BLADSY PAGE 4

ENDOSSEMENT OP / ENDORSEMENT ON 41137 /1976

EIENDOM PROPERTY Restant van Ged. 1 (Groot Pan) van die plaas Drielinge Pan Nr. 101.

32050 76 MRE

BL. 38250/85

GEKANSELLEER CANCELLED

REGISTRATEUR REGISTRAR

1985-1

R 75,000,00 29-12-1976

R 7500,00

VERBIND MORTGAGED

VIR FOR R 150 000,00

18271 94

B

1994 -07-10

REGISTRATEUR/REGISTRAR

Appendix 8C
SKA Studies

THE SCIENCE OF MEASUREMENT

Technical Report:

Topographical Analysis of Proposed Aletta Wind Farm

Work done for: BioTherm Energy

A. J. Otto and P. S. van der Merwe

Document Number: BIO/AL/15/03/27
Revision Number: REV1
Document Date: 21 April 2015

Document Approval

	Name	Affiliation	Designation	Signature
Submitted	A. J. Otto	MESA Solutions	Managing Director	
	P. S. van der Merwe	MESA Solutions	Managing Director	
	H. C. Reader	MESA Solutions	Consulting Director	

Accepted	Tatenda Ziso	BioTherm Energy	Senior Associate	

Document History

Revision	Date of Issue	Comments
DRAFT	27 March 2015	Report (#BIO/AL/15/03/27/DRAFT)
REV0	08 April 2015	Report (#BIO/AL/15/03/27/REV0)
REV1	21 April 2015	Updated SARAS protection levels and SKA threshold limits

Company Details

Name	MESA Solutions (Pty) Ltd.
Physical/Postal Address	Aan-de-Wagen Centre Aan-de-Wagen Road Stellenbosch 7600
Tel.	+27(0)72 317 9784 / +27(0)82 494 6204
Website	http://www.mesasolutions.co.za/

Executive Summary

MESA Solutions was asked by BioTherm Energy to do a topographical analysis of the terrain profile between the Aletta wind farm and the SKA closest and core-site telescopes.

- An equivalent emission level that is 10 dB below the SKA threshold (SARAS) limit was defined. This level can be verified through measurements.
- The maximum allowed emission level is related to the well-known CISPR 11/22 Class B standard.
- The total path loss is a function of topography and frequency, as well as characteristics such as the transmitter and receiver heights.
- SPLAT! propagation results show that at lower frequencies emissions below CISPR are required in the case of the closest telescope. This is mainly due to the absence of any terrain loss over this short distance.
- Towards the core site the allowable measured levels increase slightly due to additional terrain loss.
- The possibility exists that the overall lower levels would have to be achieved to limit interference to the closest telescopes.

DIRECTORS: H. C. Reader, A. J. Otto and P. S. van der Merwe | www.mesasolutions.co.za | EMAIL: info@mesasolutions.co.za
REG NO: 2002/025186/07 | POSTAL ADDRESS: P.O. Box 12572, Die Boord, Stellenbosch, 7613

Contents

Nomenclature

AGA	Astronomy Geographic Advantage
DEM	Digital Elevation Model
FSPL	Free Space Path Loss
ITM	Irregular Terrain Model
ITWOM	Irregular Terrain With Obstruction Model
KAT	Karoo Array Telescope
SARAS	South African Radio Astronomy Services
SKA	Square Kilometre Array
SKA-SA	Square Kilometre Array South Africa
SPLAT	Signal Propagation, Loss And Terrain - Analysis Tool
TL	Terrain Loss
TPL	Total Path Loss

List of Figures

DIRECTORS: H. C. Reader, A. J. Otto and P. S. van der Merwe | www.mesasolutions.co.za | EMAIL: info@mesasolutions.co.za
REG NO: 2002/025186/07 | POSTAL ADDRESS: P.O. Box 12572, Die Boord, Stellenbosch, 7613

List of Tables

1 Introduction

MESA Solutions was asked by BioTherm Energy to do a topographical analysis of the terrain profile between the Aletta Wind Farm plant and the Square Kilometre Array (SKA) closest and core-site telescopes. The wind farm is situated in the vicinity of the Karoo Central Astronomy Advantage Areas. These areas are protected against unwanted electromagnetic interference (EMI) under the Astronomy Geographic Advantage (AGA) Act [1] for the purpose of radio astronomy and related scientific endeavors. This currently includes the SKA. From the terrain evaluation we are able to determine what influences, if any, natural topographical features will have on the total expected propagation attenuation based on the location of the site. This determines the maximum allowable emission levels which the facility may generate in order to still comply with SKA threshold limits as specified by SARAS (South African Radio Astronomy Services) in [1]. The Aletta wind farm's proximity to the closest and core-site SKA telescopes are shown in Figs. 1 and 2, respectively. Also included in each figure is a basic elevation profile over the specified distance. Characteristics such as separation distance, transmitter height, and azimuth angle are given in Table 1.

It is important to note that the findings from this assessment is for the client's own edification, and will be taken into account by the SKA during its own propagation analysis. It is therefore not meant to supersede any investigation done by the SKA or relevant RFI working groups.

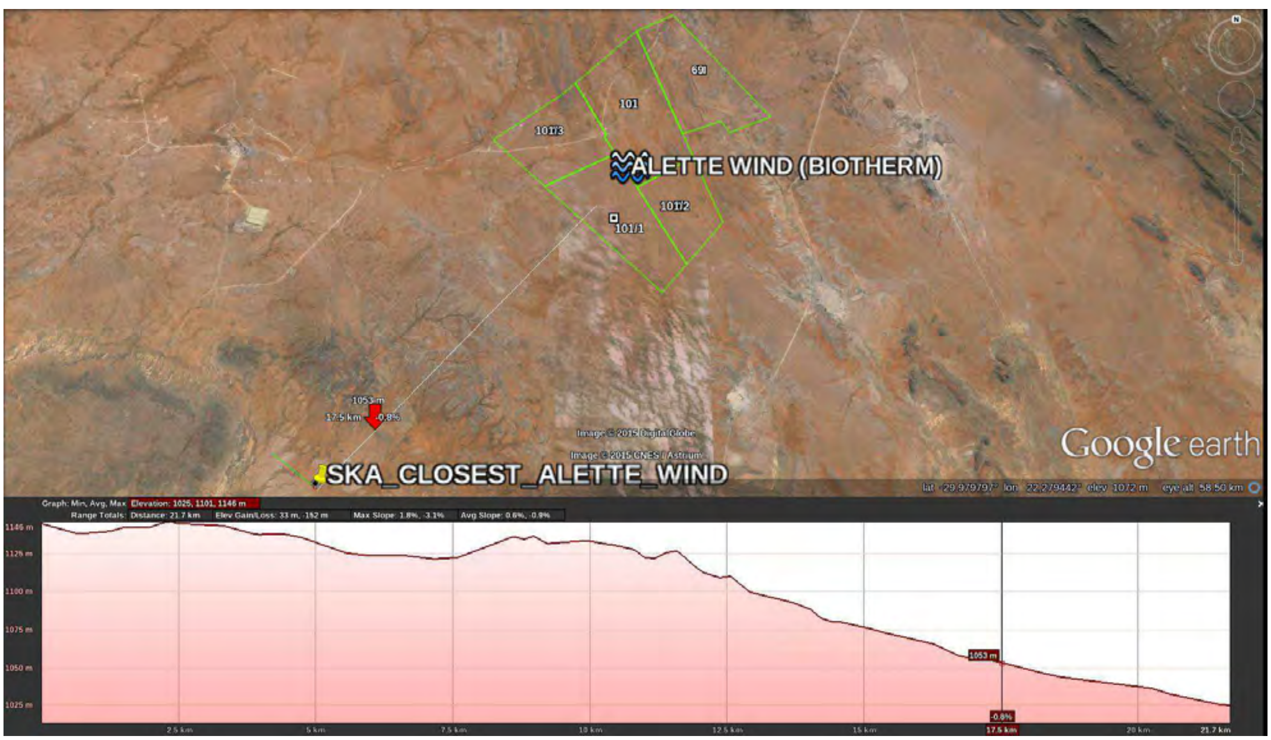

Figure 1: Google Earth location and elevation profile of Aletta Wind toward closest SKA telescope.

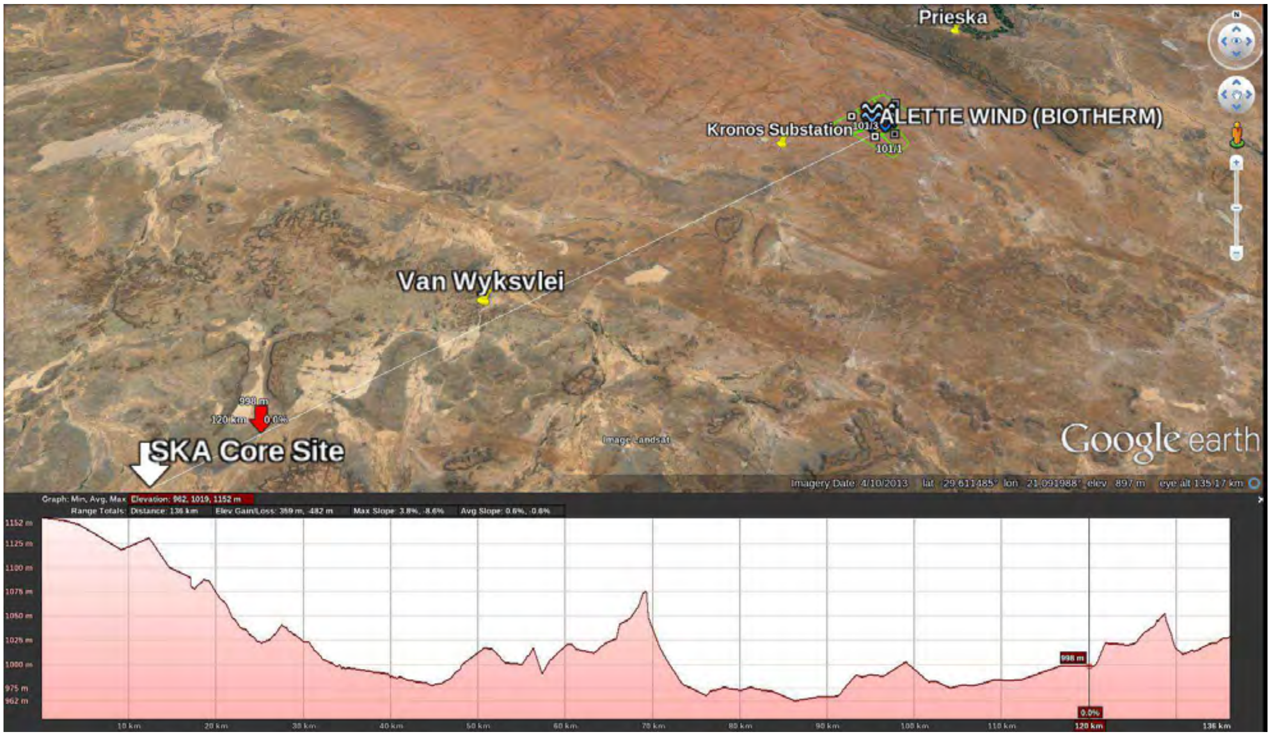

Figure 2: Google Earth location and elevation profile of Aletta Wind toward SKA core site.

Aletta Wind	SKA Core Site	Closest Telescope
Distance	135.62 km	23.92 km
Azimuth	235.66 ^{o}	223.15 ^{o}
Wind Tx Height	120 m	120 m
SKA Rx Height	15 m	15 m

Table 1: Specifications of Aletta wind farm relative to the SKA core and closest telescopes.

2 Topographical Analysis using SPLAT!

The default propagation analysis software used by MESA Solutions is called SPLAT!, which is a **S**ignal **P**ropagation, **L**oss **A**nd **T**errain analysis tool based on the *Longley-Rice Irregular Terrain Model (ITM)*, as well as the *Irregular Terrain With Obstructions Model (ITWOM 3.0)*. The software takes into account actual terrain elevation data to ultimately predict the total path loss (TPL) between a transmitter and a receiver. As part of the analysis, certain assumptions are made regarding the source characteristics. For this investigation the various parameters defining the SPLAT! propagation model are listed in Table 2. The digital elevation model (DEM) makes use of 3-arc-second (90 m) elevation resolution data.

For this investigation, the frequency range of interest are defined from 100 MHz to 3 GHz. While the upper frequency limit of the standard in [2] are specified to at least 10 GHz, the span is limited to what is practically measurable and representative of the majority of expected interference. In the analysis the allowable SKA radiation limit defined by SARAS in [1], including an additional 10 dB safety margin, are used as the reference level. This defines the maximum allowable level of radiated interference than can be tolerated at the telescope.

This maximum level, which is given as a power spectral density (PSD) in dBm/Hz, is compensated for by the TPL as predicted by SPLAT!, to provide an equivalent PSD associated with the closest and core-site telescopes. This PSD for each case is then converted to an equivalent electric field (E-field) as measured at either 10 m (frequency $<$ 1 GHz) or 3 m (frequency $>$ 1 GHz) away from the plant. The 3 and 10 m separation distances is in accordance with measurement specifications defined in the latest international special committee on radio interference's (CISPR) 11/22 Class B standard. This standard is used for reference purposes as it is internationally know and used for industry qualification. This calculation is done for a number of representative frequencies within the band of interest and defines an E-field upper limit which the plant is allowed to radiate without exceeding emission limits at the two telescope locations. Ultimately, conformance of the plant can then be determined by comparing representative measured results to the calculated levels provided.

SPLAT! Analysis Parameters	
	Aletta Wind Farm
Frequency [MHz]	100 - 3000
Earth Dielectric Constant (Relative Permittivity [F/m])	4.000
Earth Conductivity [S/m]	0.001
Atmospheric Bending Constant	301
Radio Climate	4 (Desert)
Polarisation (Vertical=1; Horizontal=0)	1
Fraction of Time	0.05
Fraction of Situations	0.05

Table 2: SPLAT! parameters for predicted 100 MHz to 3 GHz emissions from Aletta wind farm to SKA core and closest telescope.

3 Total Path Loss

Shown in Table 3 below are the values for the free space path loss (FSPL), terrain loss (TL), and total path loss (TPL) at each of the frequencies chosen for the investigation. From the table it is clear that there is minimal contribution from the TL especially at the low frequencies. This is mainly due to the absence of any major natural obstructions between the wind farm and the SKA core site as evidence from Fig. 2. The 0 dB TL at 100 MHz is a purely mathematical limitation of the software indicating a negligible contribution at that frequency over this particular terrain.

	SKA Core Site			Closest Telescope		
Frequency	SPLAT! FSPL	SPLAT! TL	SPLAT! TPL	SPLAT! FSPL	SPLAT! TL	SPLAT! TPL
100 MHz	115.11 dB	0.0 dB	**115.11 dB**	100.04 dB	0.0 dB	**100.04 dB**
300 MHz	124.66 dB	0.0 dB	**124.66 dB**	109.58 dB	0.0 dB	**109.58 dB**
500 MHz	129.09 dB	0.0 dB	**129.09 dB**	114.02 dB	0.0 dB	**114.02 dB**
700 MHz	132.02 dB	2.93 dB	**134.94 dB**	116.94 dB	0.0 dB	**116.94 dB**
1000 MHz	135.11 dB	5.97 dB	**141.08 dB**	120.04 dB	0.0 dB	**120.04 dB**
1500 MHz	138.64 dB	9.39 dB	**148.02 dB**	123.56 dB	0.0 dB	**123.56 dB**
2000 MHz	141.13 dB	11.80 dB	**152.93 dB**	126.06 dB	0.0 dB	**126.06 dB**
2500 MHz	143.07 dB	13.67 dB	**156.74 dB**	128.00 dB	0.0 dB	**128.00 dB**
3000 MHz	144.66 dB	15.20 dB	**159.86 dB**	129.58 dB	0.0 dB	**129.58 dB**

Table 3: SPLAT! Free Space Path Loss (FSPL), Terrain Loss (TL) and Total Path Loss (TPL) for vertical polarisation Aletta Wind emissions.

4 Attenuation Coverage Maps

The coverage maps in this section gives an indication of the variation in TPL as a function of frequency. This has only been done for vertical polarisation with similar results assumed for horizontal polarisation.

4.1 Closest SKA Telescope

Shown in Figs. 3 to 10 are the attenuation maps in the direction of the closest SKA telescope.

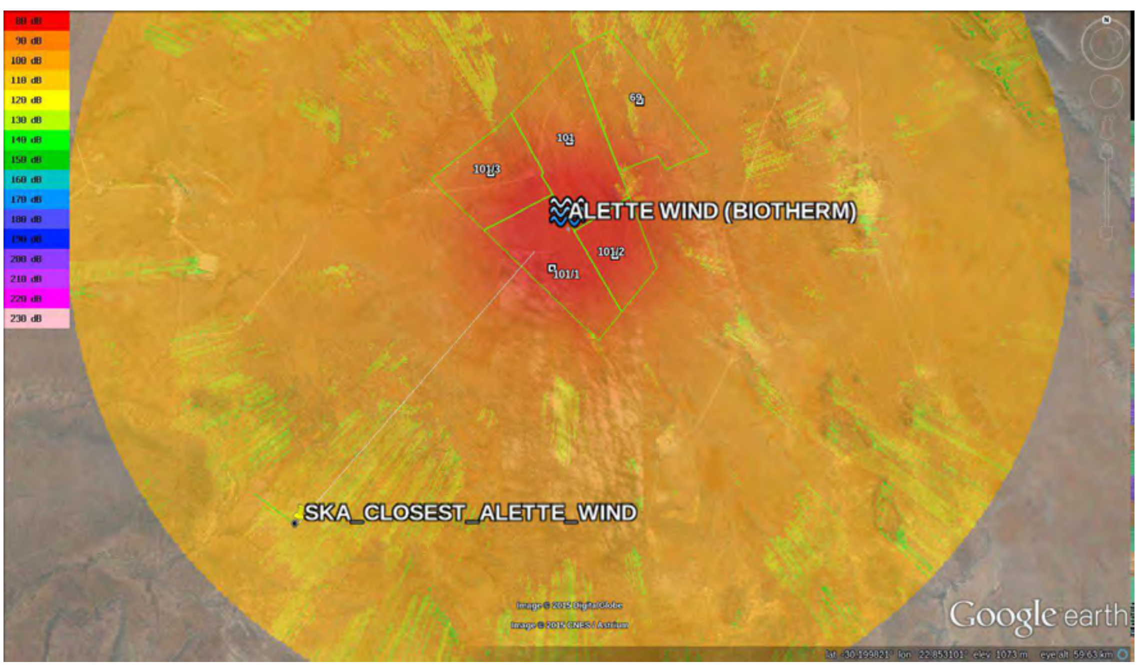

Figure 3: Attenuation map for f=100MHz from Aletta Wind to the closest SKA telescope.

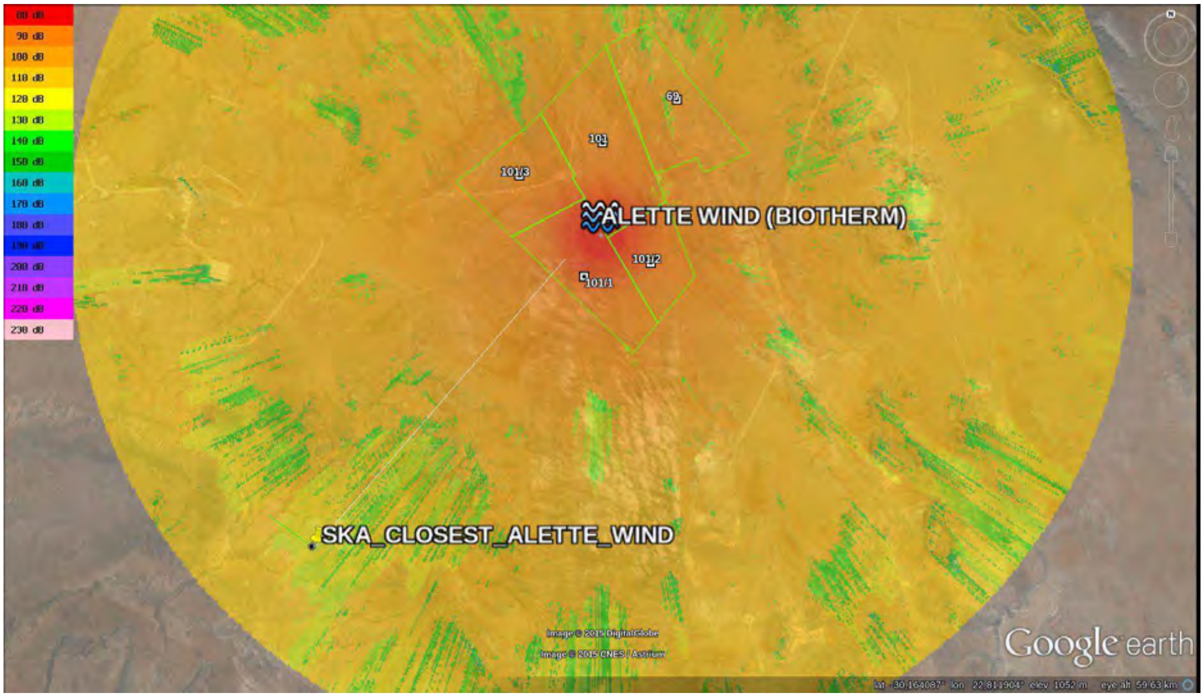

Figure 4: Attenuation map for f=300MHz from Aletta Wind to the closest SKA telescope.

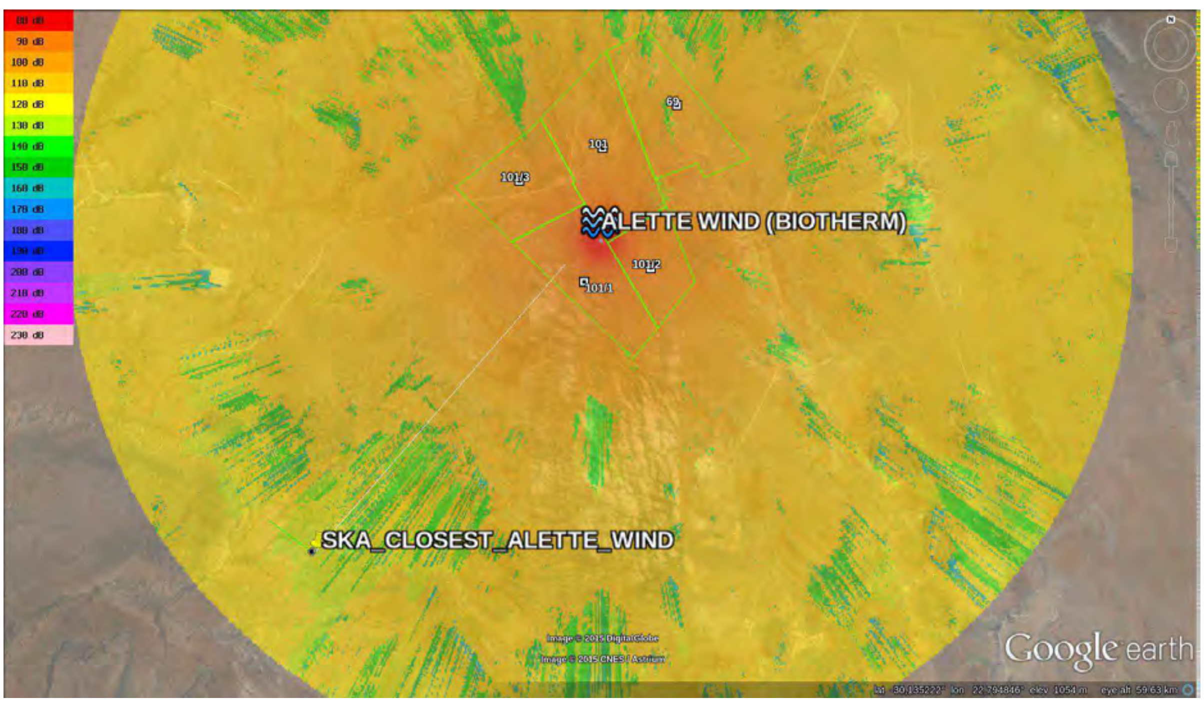

Figure 5: Attenuation map for f=500MHz from Aletta Wind to the closest SKA telescope.

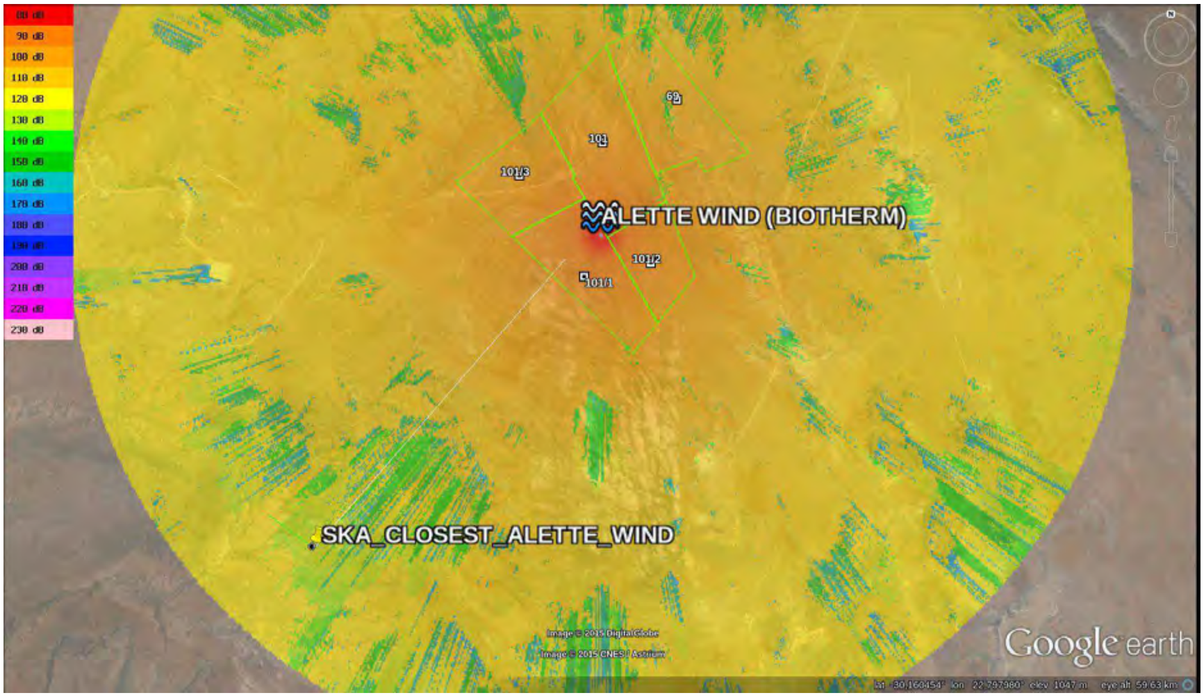

Figure 6: Attenuation map for f=700MHz from Aletta Wind to the closest SKA telescope.

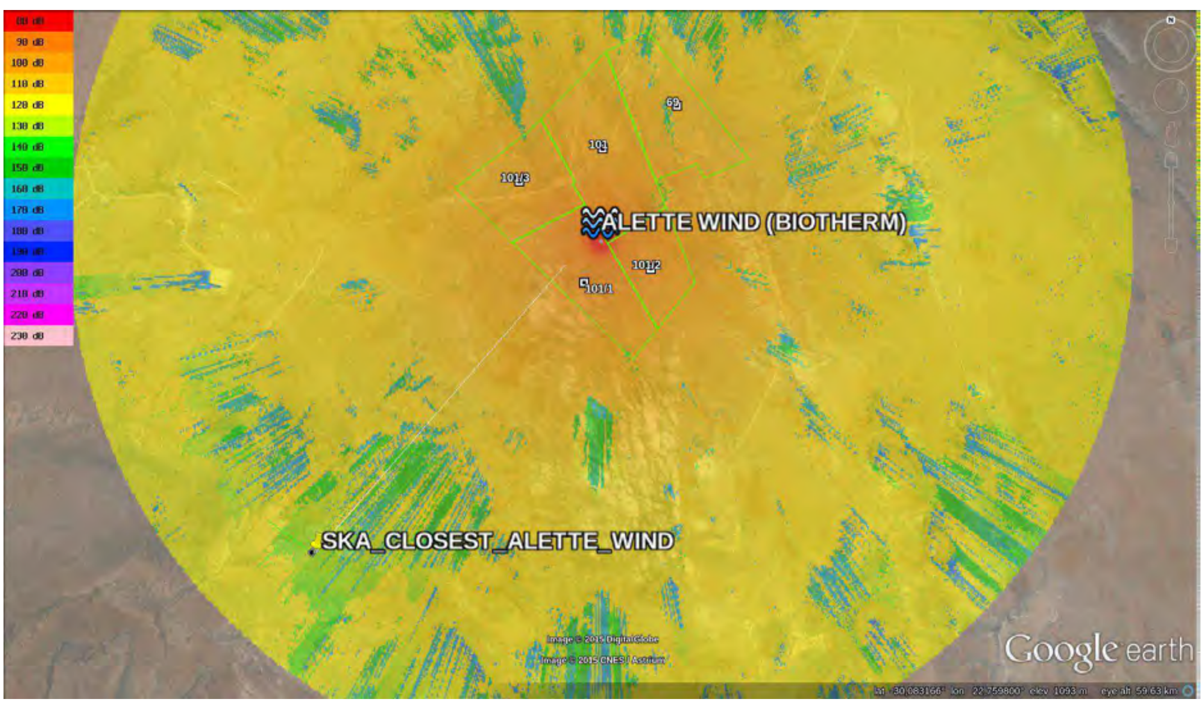

Figure 7: Attenuation map for f=1000MHz from Aletta Wind to the closest SKA telescope.

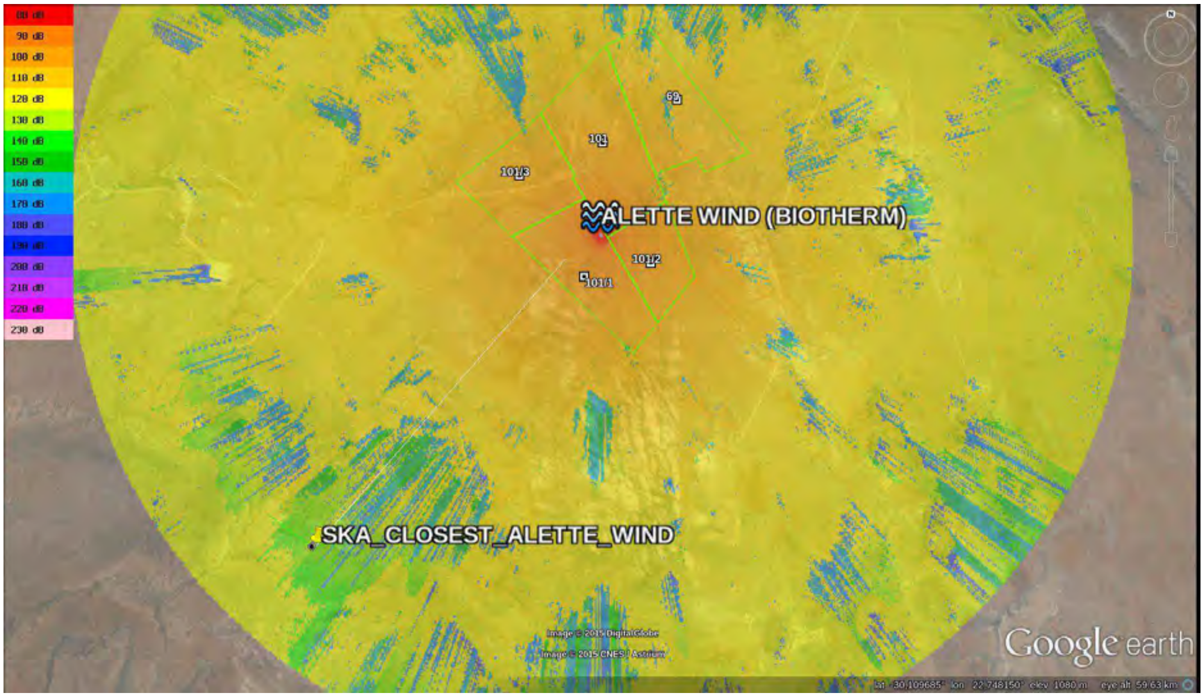

Figure 8: Attenuation map for f=1500MHz from Aletta Wind to the closest SKA telescope.

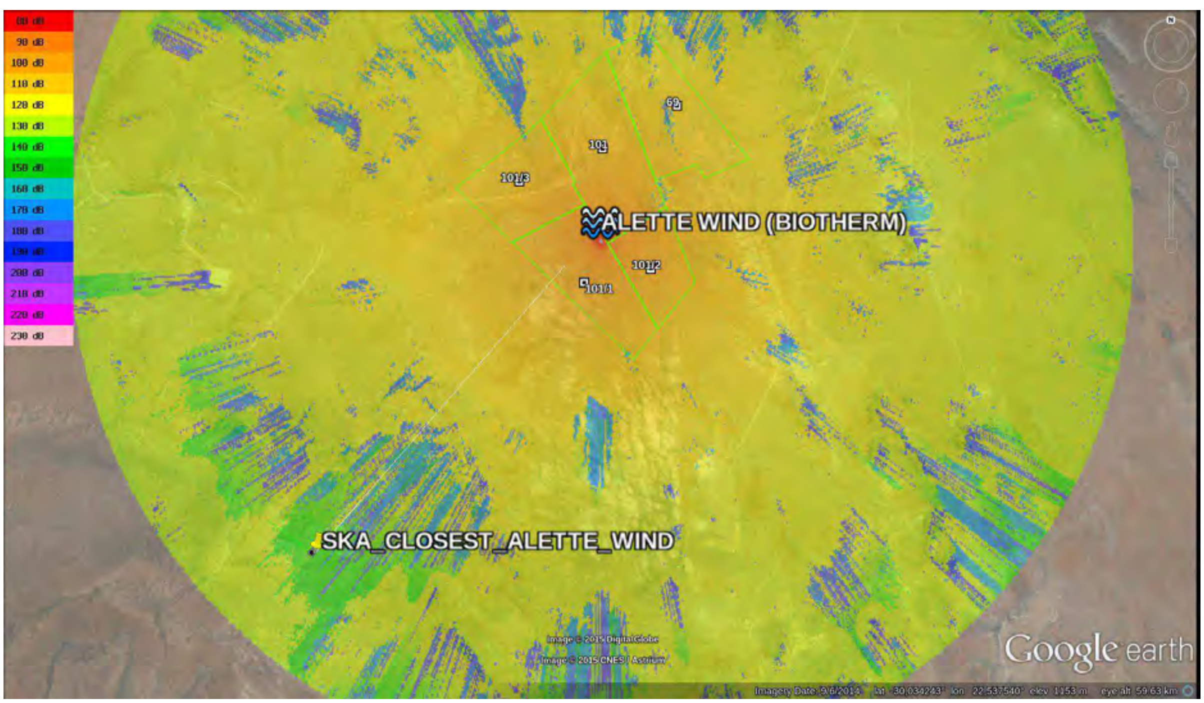

Figure 9: Attenuation map for f=2500MHz from Aletta Wind to the closest SKA telescope.

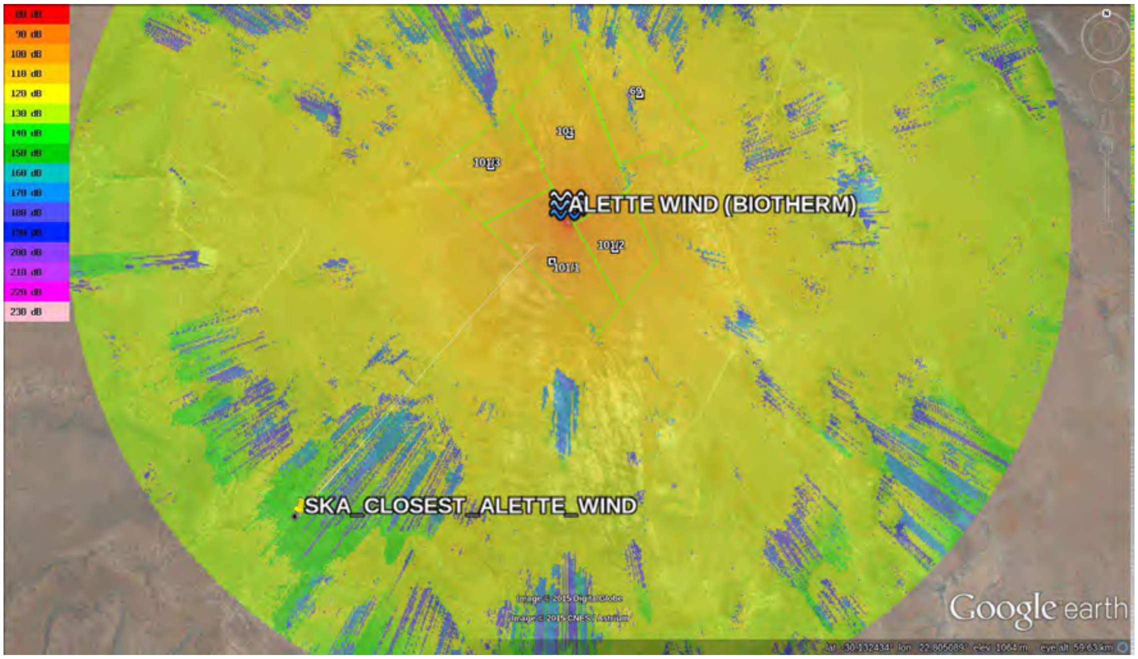

Figure 10: Attenuation map for f=3000MHz from Aletta Wind to the closest SKA telescope.

4.2 SKA Core Site

In Figs. 11 to 18 are the attenuation maps in the direction of the core site.

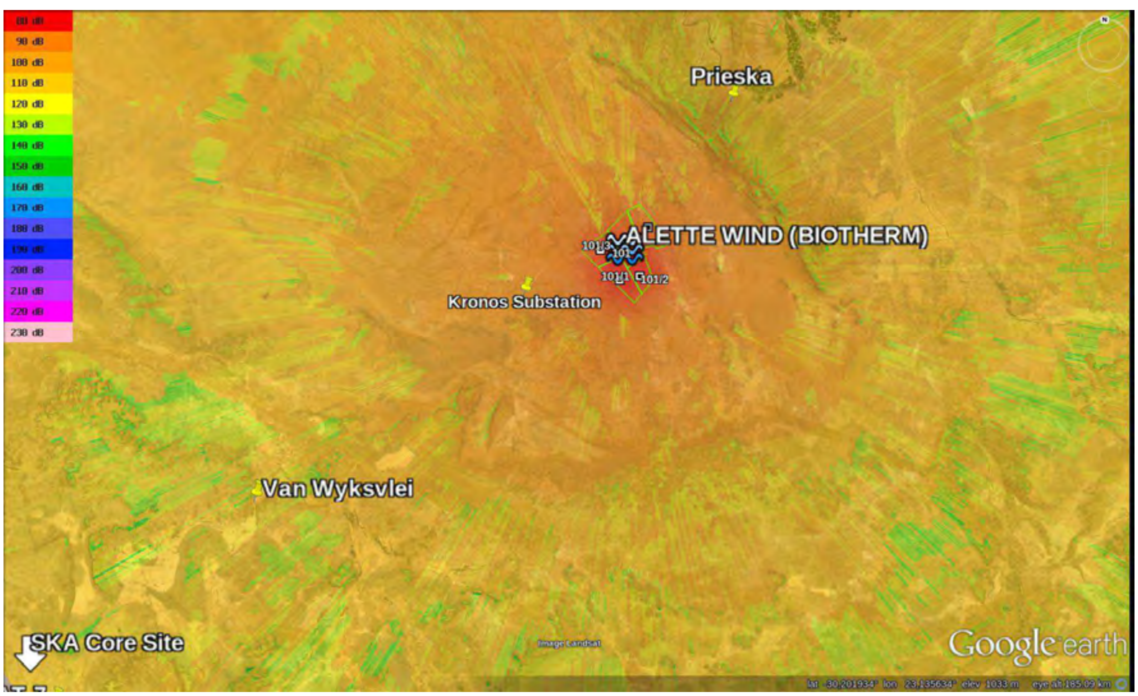

Figure 11: Attenuation map for f=100MHz from Aletta Wind to the SKA core.

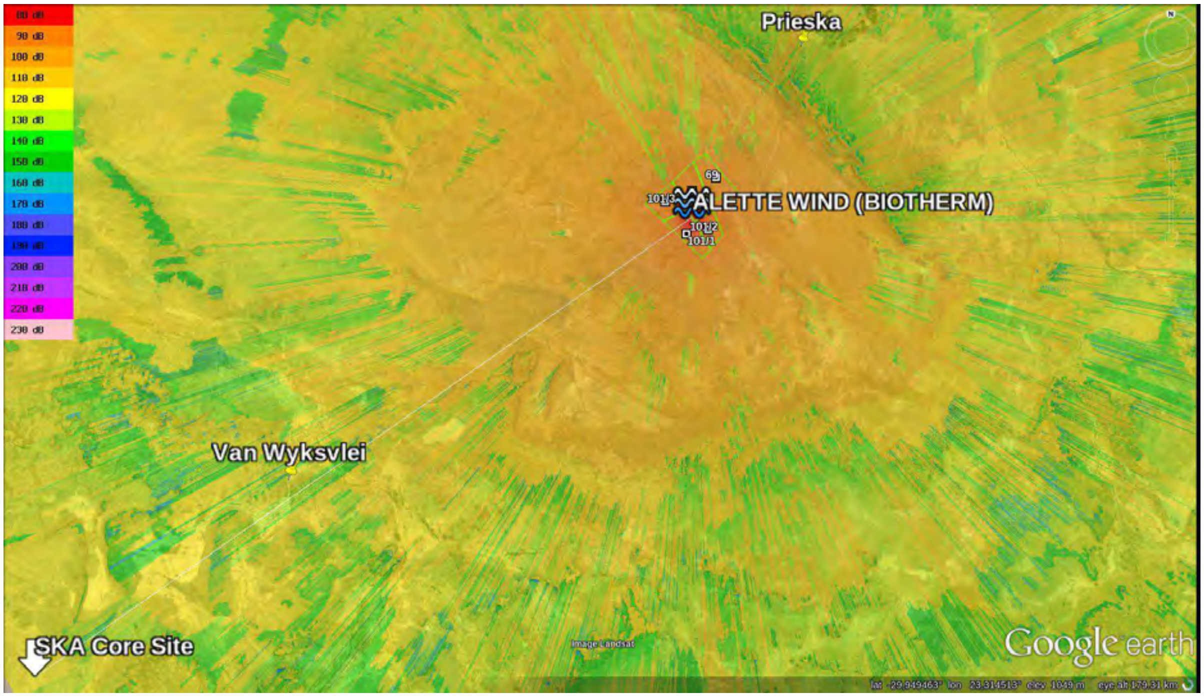

Figure 12: Attenuation map for f=300MHz from Aletta Wind to the SKA core.

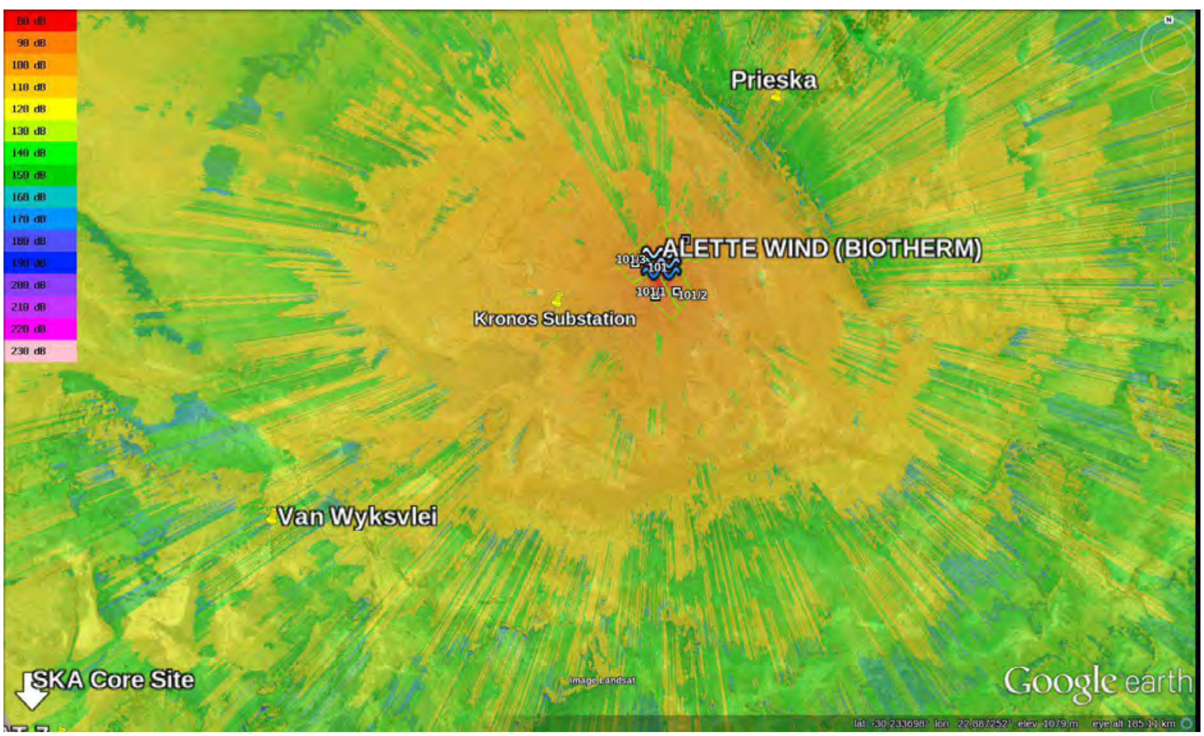

Figure 13: Attenuation map for f=500MHz from Aletta Wind to the SKA core.

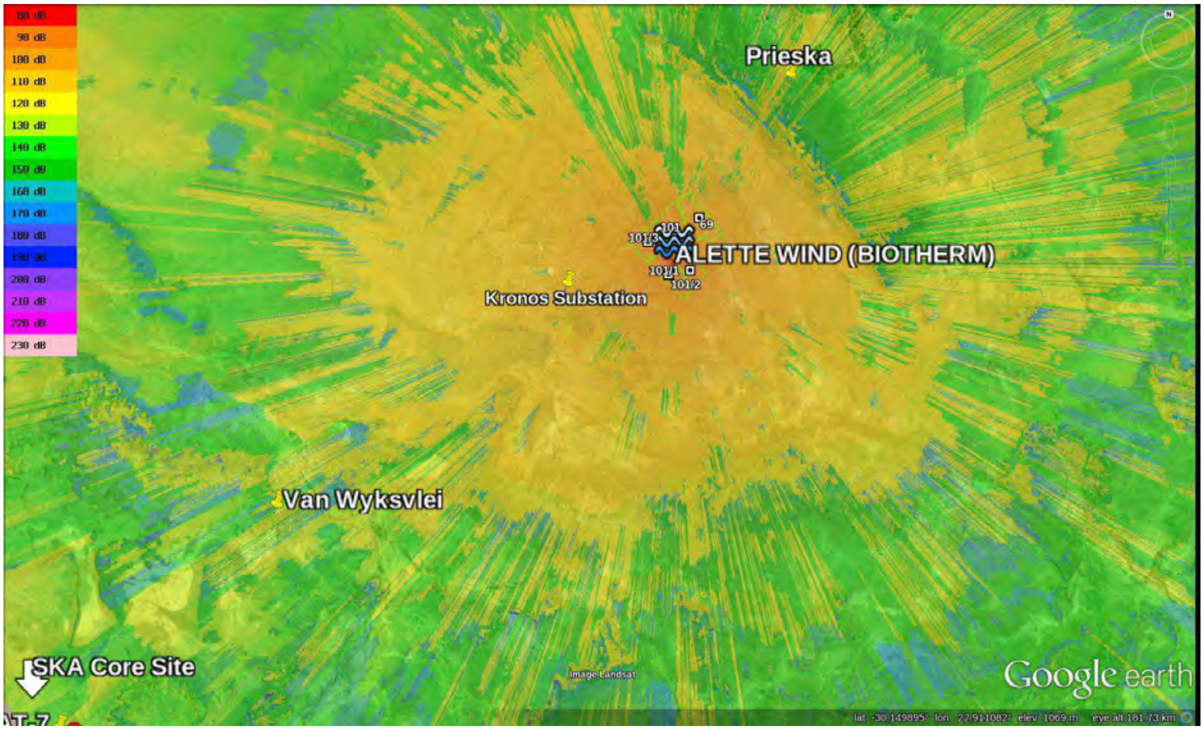

Figure 14: Attenuation map for f=700MHz from Aletta Wind to the SKA core.

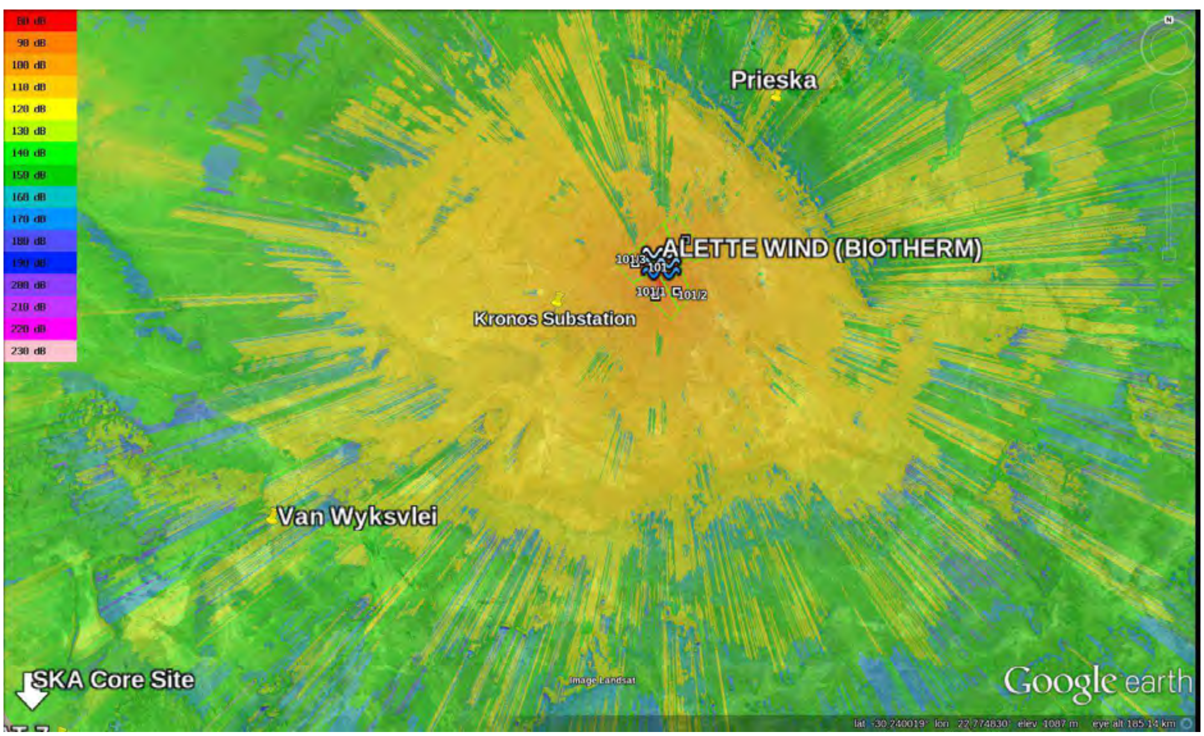

Figure 15: Attenuation map for f=1000MHz from Aletta Wind to the SKA core.

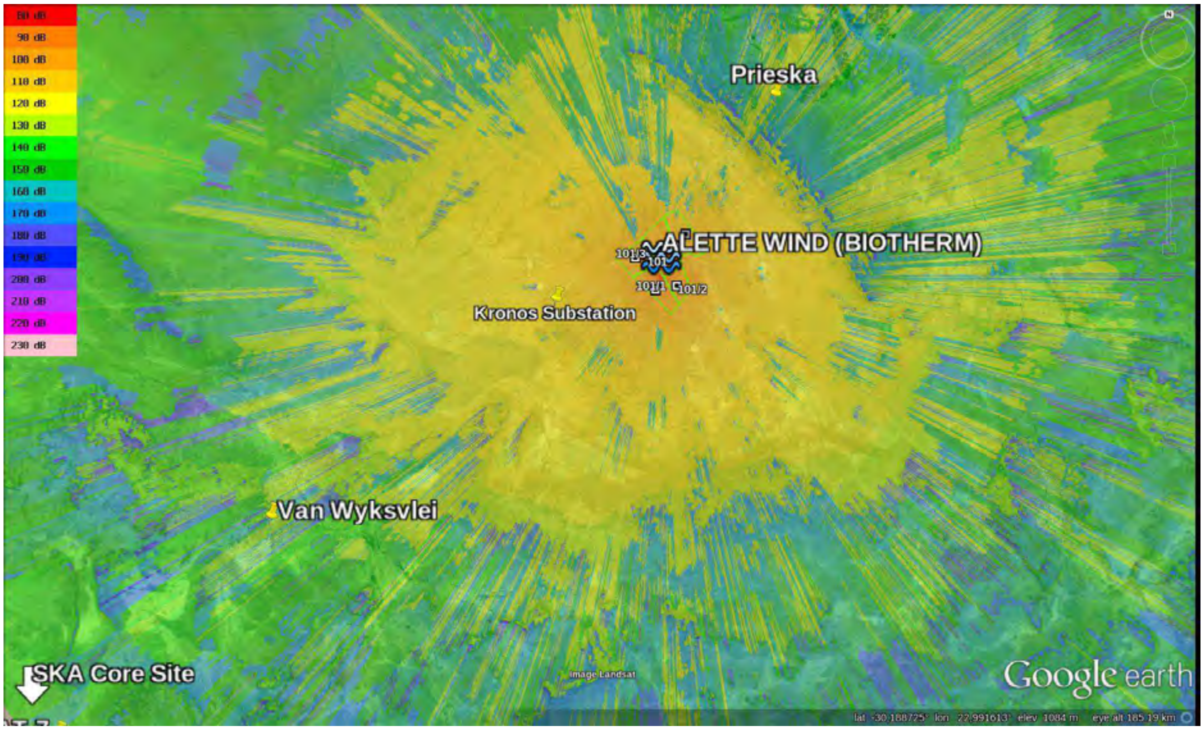

Figure 16: Attenuation map for f=1500MHz from Aletta Wind to the SKA core.

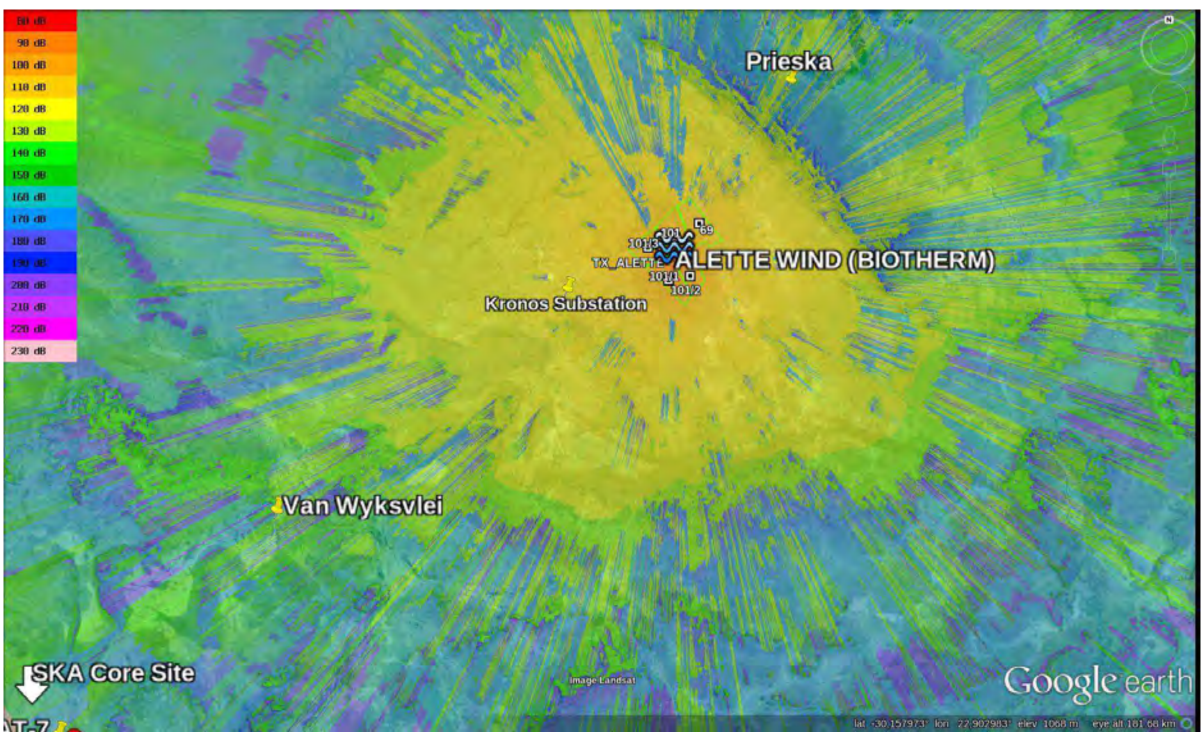

Figure 17: Attenuation map for f=2500MHz from Aletta Wind to the SKA core.

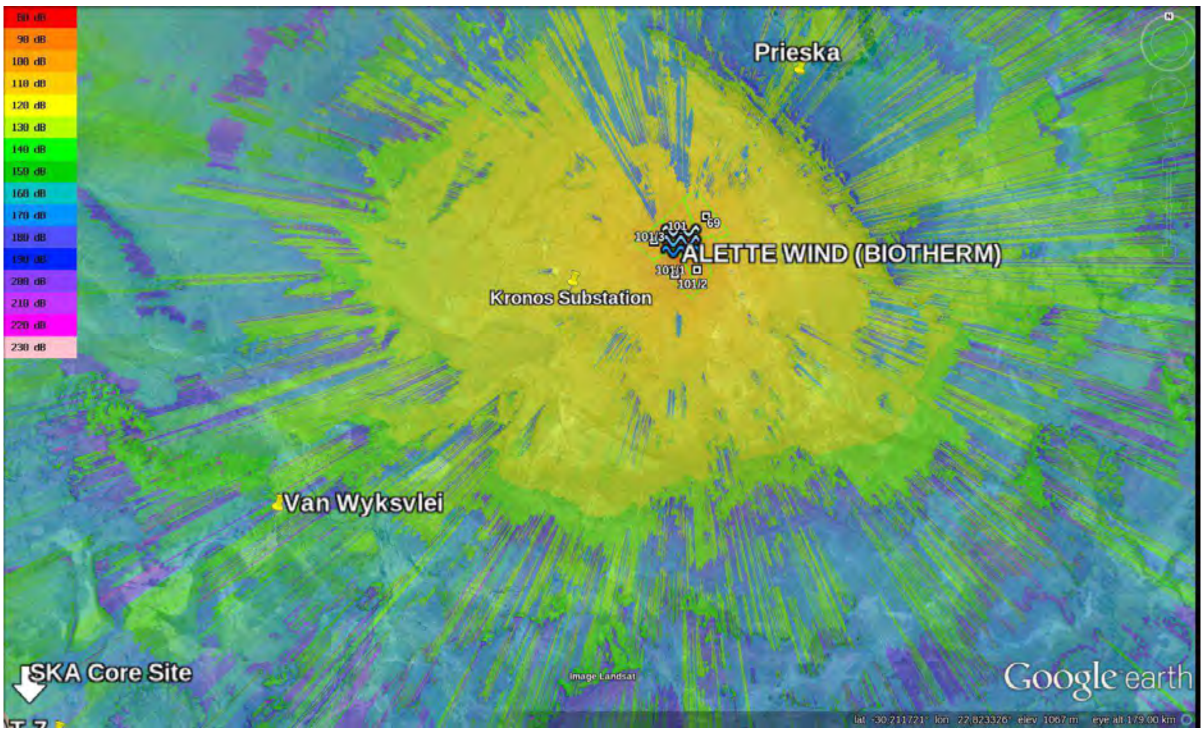

Figure 18: Attenuation map for f=3000MHz from Aletta Wind to the SKA core.

5 Fresnel Zones and Elevation Profiles

The Fresnel zones and elevation profiles, including the earth curvature, are shown in Figs. 19 to 26 for the closest SKA telescope and Figs. 27 to 34 for the core site. A more detailed terrain profile shows features not visible in a normal Google Map profile. This profile is then compensated for the earth curvature, clearly visible for the longer distance toward the core site. Important to note is the scale used in these figures. The elevation change is in meters but the separation distance varies in kilometers. The earth curvature representation is therefore somewhat enhanced.

5.1 Closest SKA Telescope

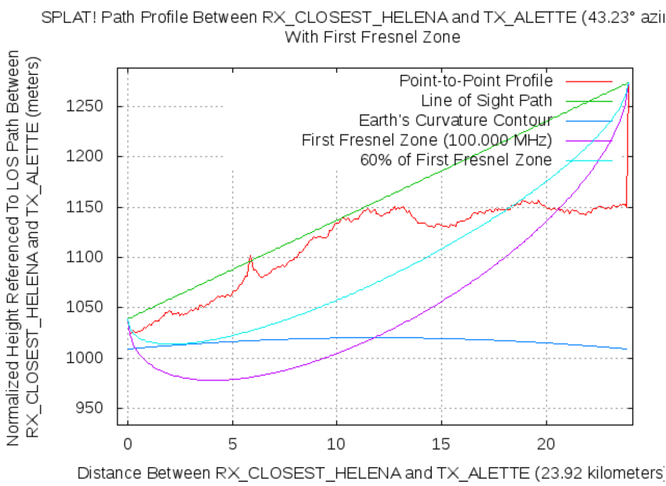

Figure 19: Elevation profile and first Freznel zones for f=100MHz from Aletta Wind to closest SKA telescope.

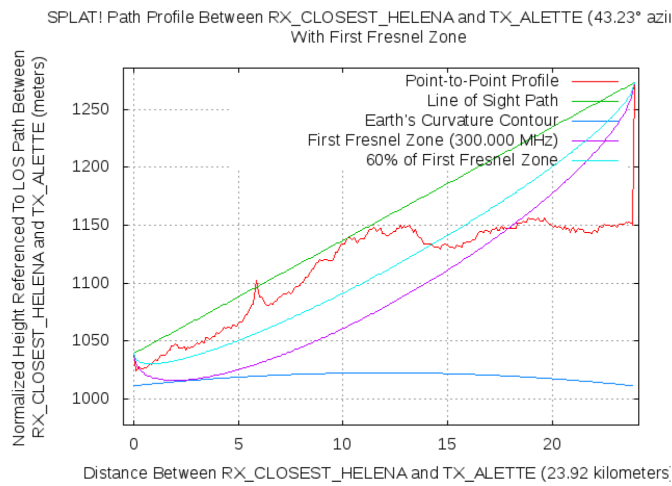

Figure 20: Elevation profile and first Freznel zones for f=300MHz from Aletta Wind to closest SKA telescope.

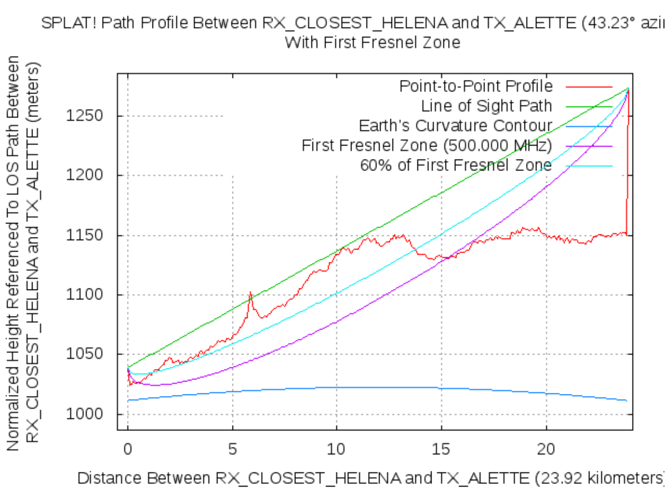

Figure 21: Elevation profile and first Freznel zones for f=500MHz from Aletta Wind to closest SKA telescope.

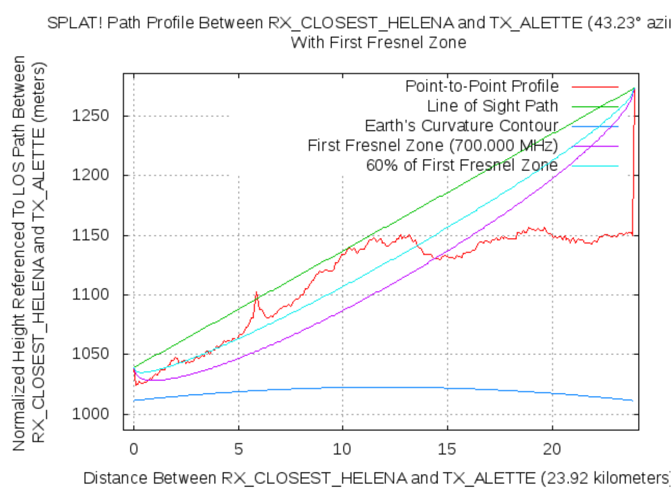

Figure 22: Elevation profile and first Freznel zones for f=700MHz from Aletta Wind to closest SKA telescope.

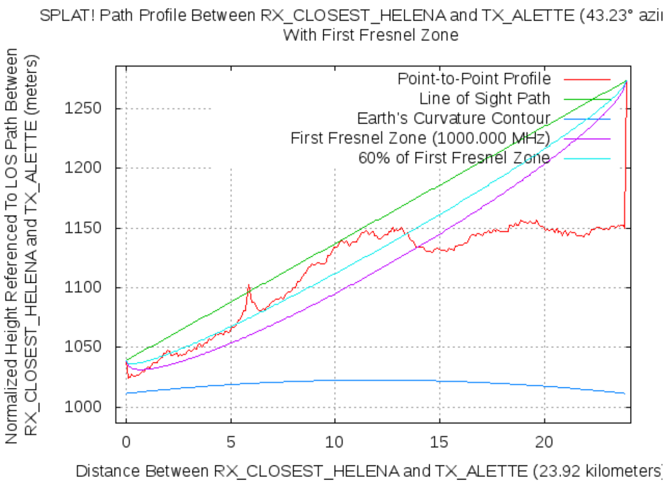

Figure 23: Elevation profile and first Freznel zones for f=1000MHz from Aletta Wind to closest SKA telescope.

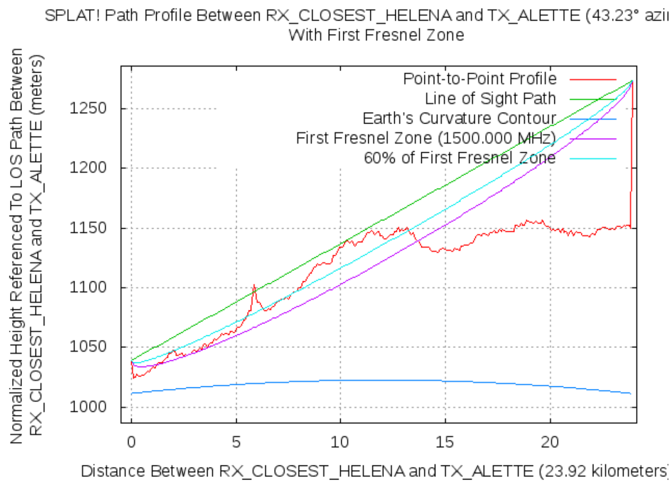

Figure 24: Elevation profile and first Freznel zones for f=1500MHz from Aletta Wind to closest SKA telescope.

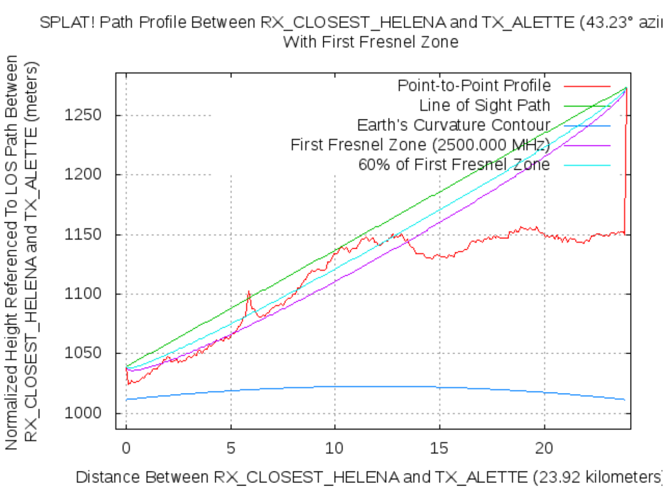

Figure 25: Elevation profile and first Freznel zones for f=2500MHz from Aletta Wind to closest SKA telescope.

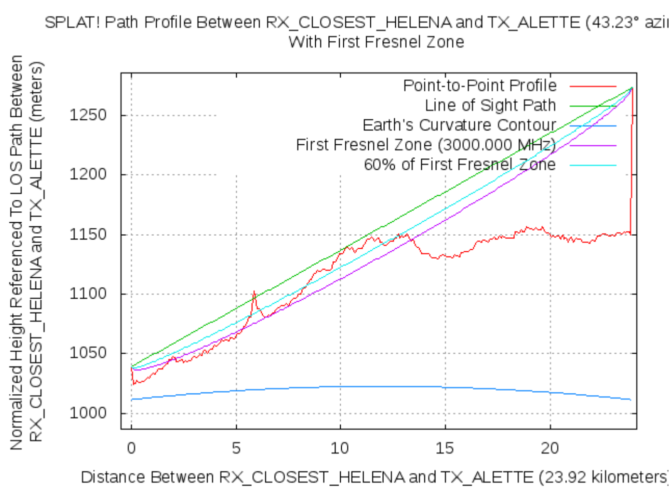

Figure 26: Elevation profile and first Freznel zones for f=3000MHz from Aletta Wind to closest SKA telescope.

5.2 SKA Core Site

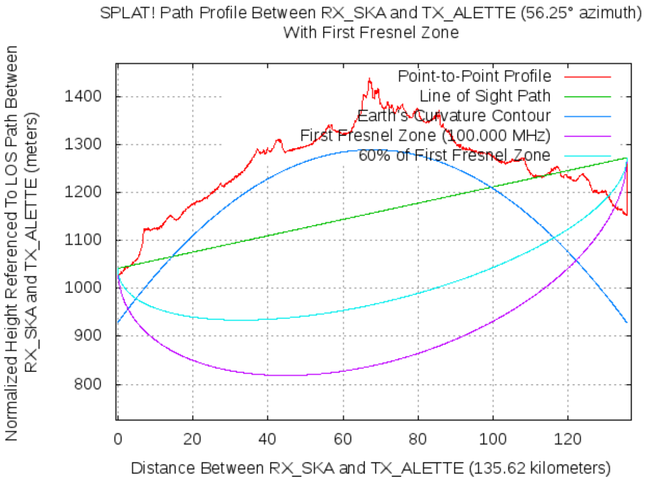

Figure 27: Elevation profile and first Freznel zones for f=100MHz from Aletta Wind to SKA core.

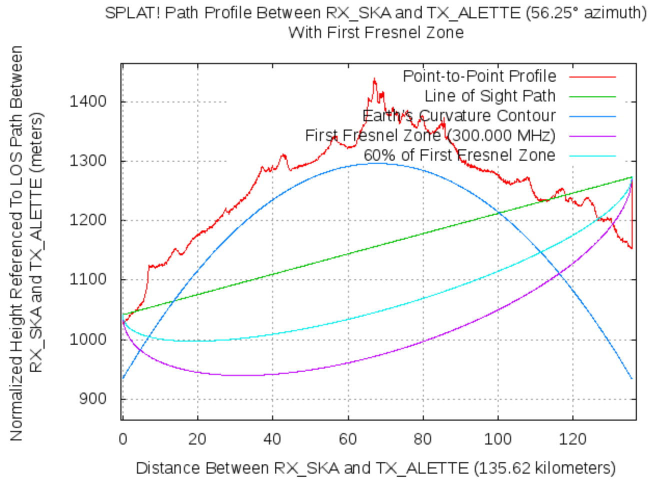

Figure 28: Elevation profile and first Freznel zones for f=300MHz from Aletta Wind to SKA core.

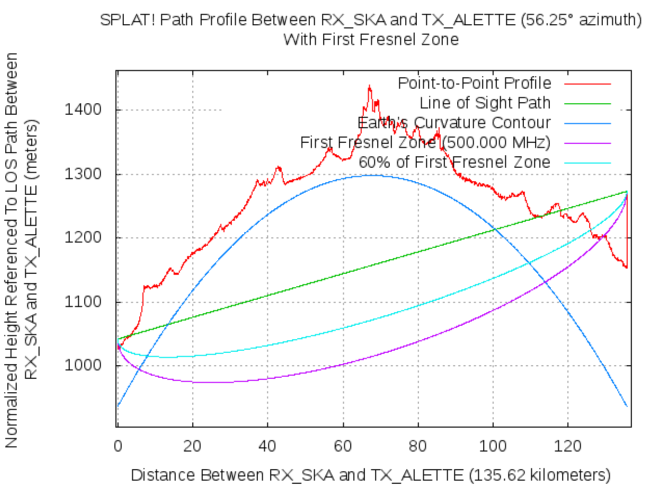

Figure 29: Elevation profile and first Freznel zones for f=500MHz from Aletta Wind to SKA core.

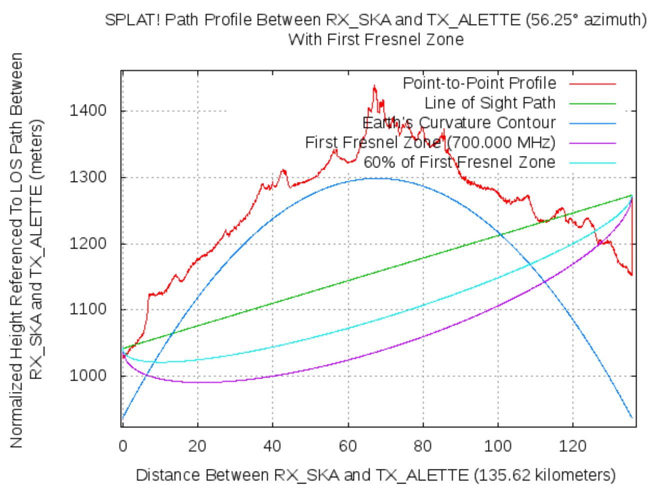

Figure 30: Elevation profile and first Freznel zones for f=700MHz from Aletta Wind to SKA core.

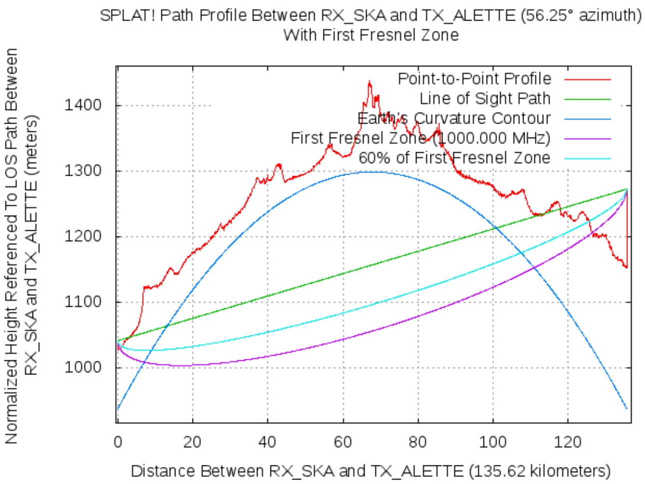

Figure 31: Elevation profile and first Freznel zones for f=1000MHz from Aletta Wind to SKA core.

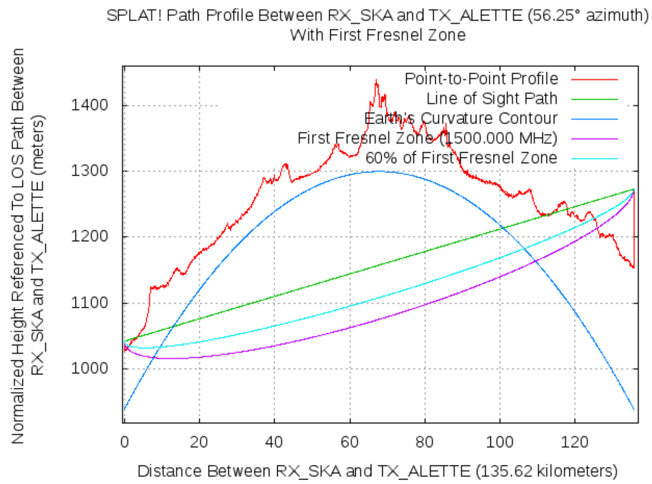

Figure 32: Elevation profile and first Freznel zones for f=1500MHz from Aletta Wind to SKA core.

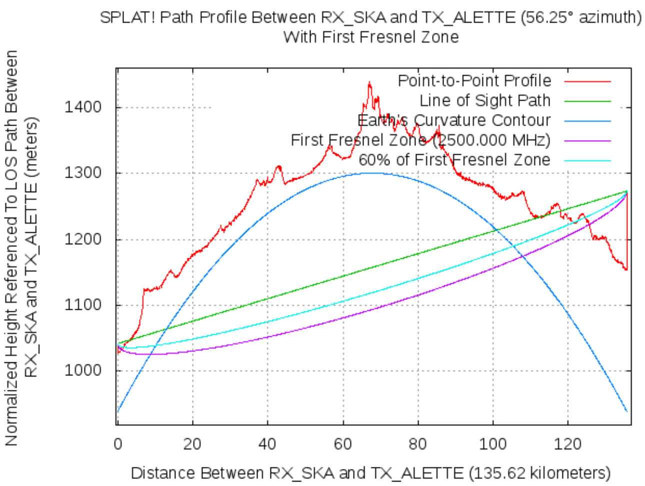

Figure 33: Elevation profile and first Freznel zones for f=2500MHz from Aletta Wind to SKA core.

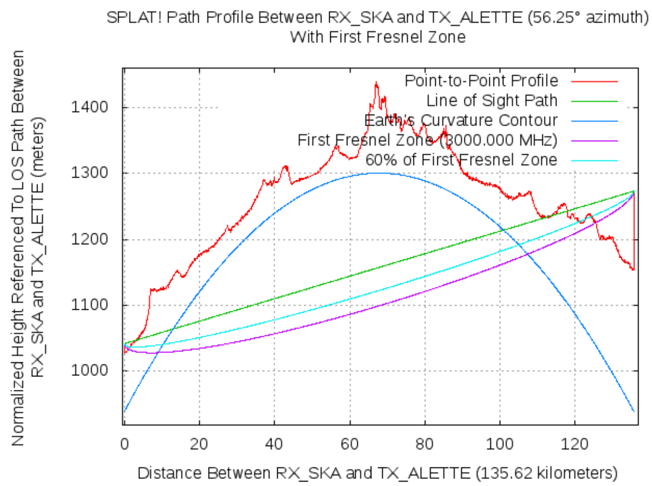

Figure 34: Elevation profile and first Freznel zones for f=3000MHz from Aletta Wind to SKA core.

6 SKA Threshold Limits (SARAS)

The results shown in this section are the comparison of the acceptable levels as measured at 3 and 10 m distances from the plant, which will produce radiated emission levels that are 10 dB below the SKA threshold limits as defined by SARAS in [1]. This takes into account the TPL calculated by SPLAT!.

6.1 Procedure

The required power spectral density (PSD) of the radiated emission levels experienced by the telescopes, as shown by the *black squares* in Figs. 35 and 37, is given by:

$$\mathrm{PSD}_{\mathrm{Required}}\ [\mathrm{dBm/Hz}] = \mathrm{PSD}_{\mathrm{SARAS\ Continuum}}\ [\mathrm{dBm/Hz}] - 10\ \mathrm{dB} \tag{1}$$

Considering the total path loss (TPL) calculated by SPLAT!, the required PSD at the source shown by the *red dots* in Figs. 35 and 37 is therefore given by:

$$\mathrm{PSD}_{\mathrm{Source}}\ [\mathrm{dBm/Hz}] = \mathrm{PSD}_{\mathrm{Required}}\ [\mathrm{dBm/Hz}] + \mathrm{TPL}\ [\mathrm{dB}] \tag{2}$$

The effective isotropic radiated power (EIRP) level at the source, as measured according to the CISPR 22 Class B standard with a RBW and distance of 120 kHz and 10 m (f < 1 GHz), and 1 MHz and 3 m (f > 1 GHz) respectively, is given by:

$$\mathrm{EIRP}\ [\mathrm{dBm}] = \mathrm{PSD}_{\mathrm{Source}}\ [\mathrm{dBm/Hz}] + 10\log_{10}(\mathrm{RBW})\ [\mathrm{Hz}] \tag{3}$$

The electric field (E_0) associated with the EIRP defined in Eq. 3, again as measured according to the CISPR 22 Class B standard, is given by:

$$E_0 = \mathrm{EIRP} - 20\log_{10} D + 104.8 \tag{4}$$

The allowable level of E-field to be measured, compared to the CISPR 22 Class B standard, is given by the *blue diamonds* in Figs. 36 and 38.

6.2 Closest SKA Telescope

The results in Fig. 35 are a comparison in terms of power spectral density, and in 36 in terms of E-field for the closest SKA telescope.

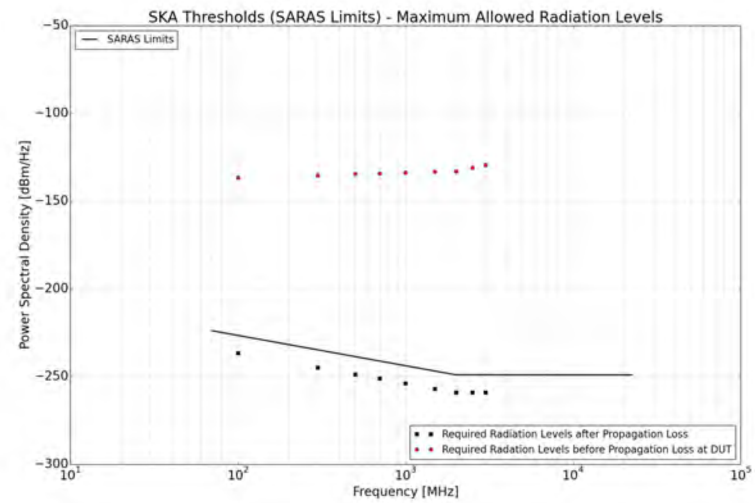

Figure 35: Aletta Wind maximum allowed PSD [dBm/Hz] radiation limit to ensure SKA threshold (SARAS) - 10 dB at the closest SKA telescope.

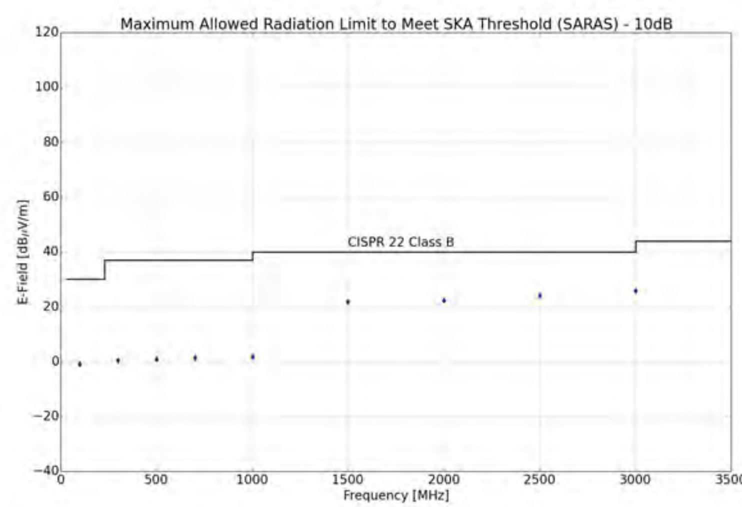

Figure 36: Aletta Wind maximum allowed E-Field [dBμV/m] to be measured according to CISPR 22 Class B at 10 m from DUT using RBW = 120 kHz for f < 1 GHz; and at 3 m from DUT using RBW = 1 MHz for f > 1 GHz to ensure SKA threshold (SARAS) - 10 dB at the closest SKA telescope.

6.3 SKA Core Site

The results in Fig. 37 are a comparison in terms of power spectral density, and in Fig. 38 in terms of E-field for the core-site telescope.

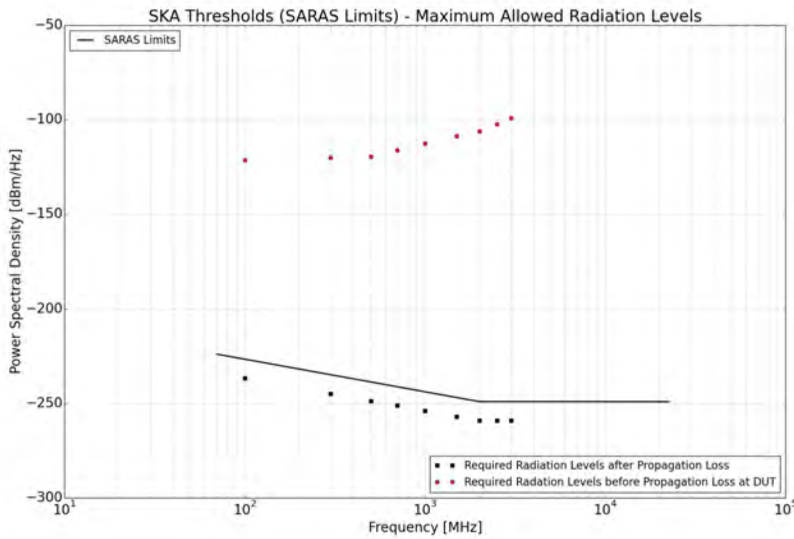

Figure 37: Aletta Wind maximum allowed PSD [dBm/Hz] radiation limit to ensure SKA threshold (SARAS) - 10 dB at the SKA core site.

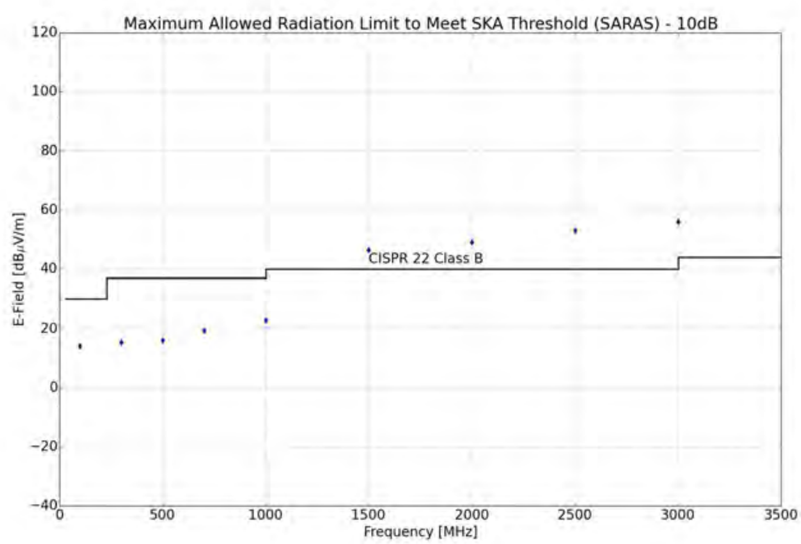

Figure 38: Aletta Wind maximum allowed E-Field [dBμV/m] to be measured according to CISPR 22 Class B at 10 m from DUT using RBW = 120 kHz for f < 1 GHz; and at 3 m from DUT using RBW = 1 MHz for f > 1 GHz to ensure SKA threshold (SARAS) - 10 dB at the SKA core site.

The proximity of the wind farm to the closest telescope means that there is only FSPL and essentially no TL as evident from Table 3. Additional TL in the propagation towards the core site, leads to the slightly higher allowable levels compared to CISPR as shown in Fig. 38. However, overall compliance would likely be determined by the lowest allowable emissions to help reduce the effect of interference on the outlying telescopes as much as possible.

7 Conclusion

MESA Solutions was asked by BioTherm Energy to do a topographical analysis of the terrain profile between the Aletta wind farm and the SKA closest and core-site telescopes. The purpose of the investigation is to define a level that can be verified through measurements which will result in an equivalent emission level that is 10 dB below the SKA threshold limit. This measurement level is influenced by the TPL between both telescope locations. However, the TPL is a function of topograhy and frequency as well as characteristics such as the transmitter and receiver heights. The measurement level is related to the well-known CISPR 11/22 Class B standard that is defined at a measurement distance of 10 m for frequencies below 1 GHz and at 3 m for frequencies above 1 GHz.

From the results in Section 6 it is clear that at lower frequencies, emissions below CISPR are required especially in the case of the closest telescope. This is mainly due to the absence of any TL over this short distance. Towards telescopes in the core site, the allowable measured levels increase slightly due to the additional TL. The possibility exists that the overall lower levels would have to be achieved to limit interference to the closest telescopes as much as possible.

MESA Solutions
Drs A. J. Otto and P. S. van der Merwe
March 2015

References

[1] *Astronomy Geographic Advantage Act, 2007*, No. 21 of 2007, Government Gazette, Vol. 516, No. 31157, Cape Town, Republic of South Africa, 17 June 2008.

[2] P. Dewdney and G. Han Tan, *SKA EMI/EMC Standards and Procedures*, Technical Report SKA-TEL-SKO-0000202, Revision 1, Square Kilometre Array (SKA) Organisation, Jodrell Bank Observatory, UK, 10 January 2015.

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PATH LOSS AND RISK ASSESSMENT REPORT FOR ALETTA WINDFARM

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ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
AM	Amplitude Modulation
CAL	Calibration
CCW	Counter Clockwise
CM	Common Mode
E-Fields	Electric Fields
EM	Electro Magnetic
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
Eq	Equation
EUT	Equipment Under Test
Fr	Resonant frequency
H- Fields	Magnetic Fields
IEEE	Institute of Electrical and Electronic Engineers
MIL-STD	Military Standard
PSU	Power Supply Unit
R&S	Rohde and Schwarz
RF	Radio Frequency
SE	Shielding Effectiveness
SELDS	Shielded Enclosure Leak Detection System
SKA	Square Kilometer Array

TABLE OF CONTENTS

1. INTRODUCTION

An area, 15km east of Copperton in the Northen Cape Province, has been identified for the Aletta Windfarm Facility (Aletta) development by BioTherm Energy (Pty) Ltd (BioTherm).

The SKA is a stakeholder mentioned in the Environmental Authorisation of the proposed project. In order to determine whether the planned windfarm development could have any influence on the SKA, BioTherm requested a risk evaluation of the planned development to SKA activities.

The frequency band of concern for SKA mid-band is 200MHz to 20GHz.This assessment does not consider any potential telecommunication services or networks that are to be established as part of the operational plan.

This initial high level risk assessment would enable one to estimate the maximum permissible radiated emissions from the equipment installed within the Aletta and will be compared to known radiated emission data from the Acciona WTG.

1.1 REFERENCED AND APPLICABLE DOCUMENTS

[1] Regulations on Radio Astronomy Protection Levels in Astronomy Advantage Areas Decleared for the Purposes of Radio Astronomy No.R 90. Government Gazette 10 February 2012 (35007).
[2] K0000-2001V1-02 R: SKA Standard for calculating RFI Threshold Levels – RT Lord 8 December 2010.
[3] R 6387/15 Emission test report for the Gouda Windfarm: ITC Services 10 September 2015
[4] R 6487/15 Emission Test Report for the Cookhouse Substation: ITC Services 13 October 2015

2. METHODOLOGY

This phase of assessment consists of a paper exercise to determine technology risks (power conversion, wireless control systems, telemetry etc) of the renewable energy system. A total of 80 Acciona AW125/3000 turbines at 100m hub height are preliminary earmarked for installation at Aletta. These were characterized for the Preferred Bidder Garob Windfarm Facility development during August 2015. A second phase of assessment may become necessary, consisting of in-field measurements, to confirm results or provide further input. The proposed site of the renewable energy installation is also plotted with reference to the MeerKAT, SKA Phase 1 and SKA Phase 2 telescope locations.

SARAS receiver protection levels against expected received amplitudes from the renewable power technology are determined and plotted. The [1]EN 55022 Class B emission standards are also provided as reference.

Permissible emission levels, assuming attenuation between the proposed site and nearest four SKA stations as determined by the Irregular Terrain Model (Longley Rice model for frequencies between 20MHz and 20GHz), are presented in Graph 4. The mean values of the ITU-R P.1546-4 Land Path propagation model statistical simulation based on the Monte-Carlo method correlated well the ITM values. The reduction in power density of an electromagnetic wave as it propagates is a function of free-space loss (natural expansion of the wave front in free space i.e distance between source and receiver), diffraction loss (part of the wave front is obstructed by an obstacle, in this case terrain such as a hill), vegetation and foliage (environment) and the propagation medium (dry/ moist air in this case) to name a few.

Graph 5 shows permissible emission levels based on the worst case (minimum) path loss as calculated with Monte Carlo based ITU 1546-4 path loss software and can be compared to known emissions from comparable installations to support the evaluation of mitigation requirements.

The following inputs are required for this Analysis Phase:

- SARAS protection levels
- SKA dish(es) location most likely to be affected
- Identification of potential interference sources
- Block diagram and description of potential interference source building blocks
- EMC test reports if available
- Potential source measurements, should EMC Test Reports not be available or not be representative of the installation.

[1] Superseded by EN 50561-1:2013 and EN 55032: 2012

3. TECHNOLOGY DESCRIPTION

The Acciona wind turbine system has the following building blocks elements:

- Rotor (Blades, hub and pitch system)
- Nacelle housing the generator, gearbox, yaw system and monitoring/control system (top controller)
- Tower (concrete) housing in its base monitoring/control system (ground controller), power converter and transformer

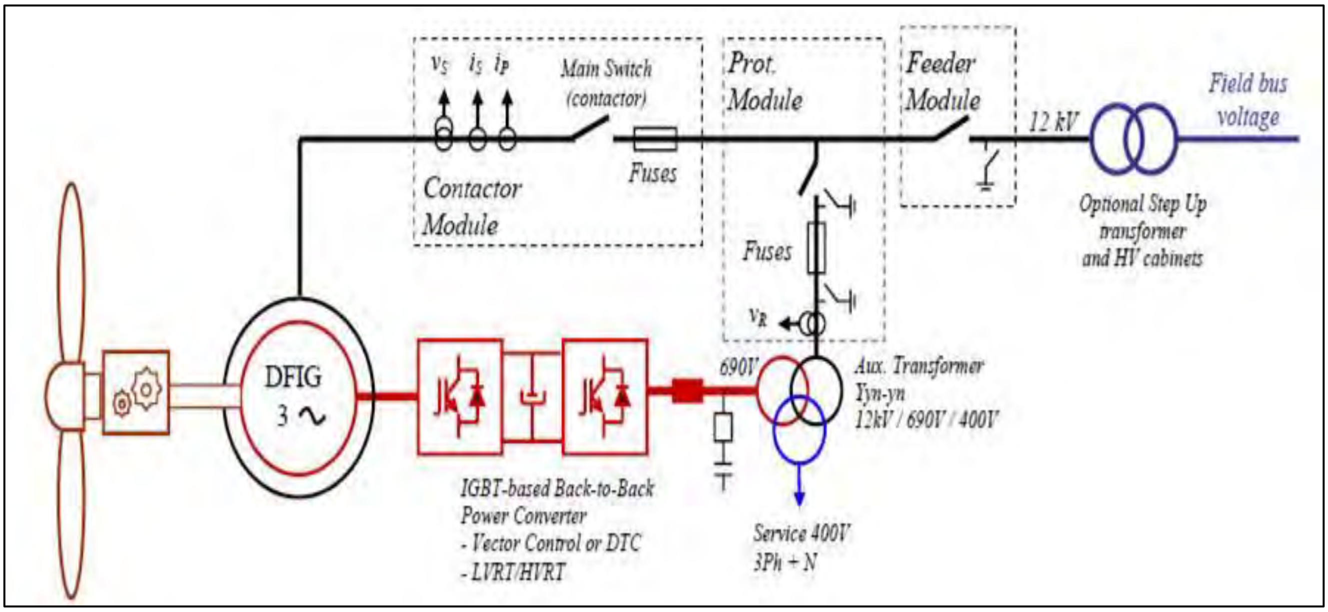


Figure 1: Wind turbine block diagram

4. RISK IDENTIFICATION

4.1 TECHNOLOGY RISKS

The following building blocks are viewed as potential interference sources:

- Control/ monitoring systems – specially nacelle mounted systems
- Power conversion equipment (rectifier/ invertor systems)
- Control and operations centre (computer equipment)

4.1.1 Control/ monitoring systems

- Environmental sensors
- Warning lights
- Cabinets housing PLC equipment
- Variable speed drives (yaw and pitch control system)

4.1.2 Control and operations centre

Equipment installed in the control and operations centre should comply with EN55022. The control and operations building shielding effectiveness should be at least 10dB, unless a 10dB safety margin is added to the EN55022 limit.

4.1.3 Power Convertor

- Thyristor/ IGBT switching rectification and invertor circuits
- UPS for control circuits

4.1.4 Cumulative emissions

A large number of non-correlated noise sources (inverters, telemetry, controls etc.) could increase the noise floor at a receiving site distant from the noise sources. This was however included in the measurement data of

R 6387/15. Adding more plants will result in a theoretical increase of 10 log N dB where N equals the number of plants.

4.2 SITE LOCATION

4.2.1 Area Map

Picture 1: Area map showing location relative to SKA

Four WTG locations (WTG 3, WTG 5, WTG 42 and WTG 79) are shown at the site perimeters.

4.2.2 Local Map

Picture 2: Local map showing nearest four SKA Locations

4.2.3 Elevation Maps

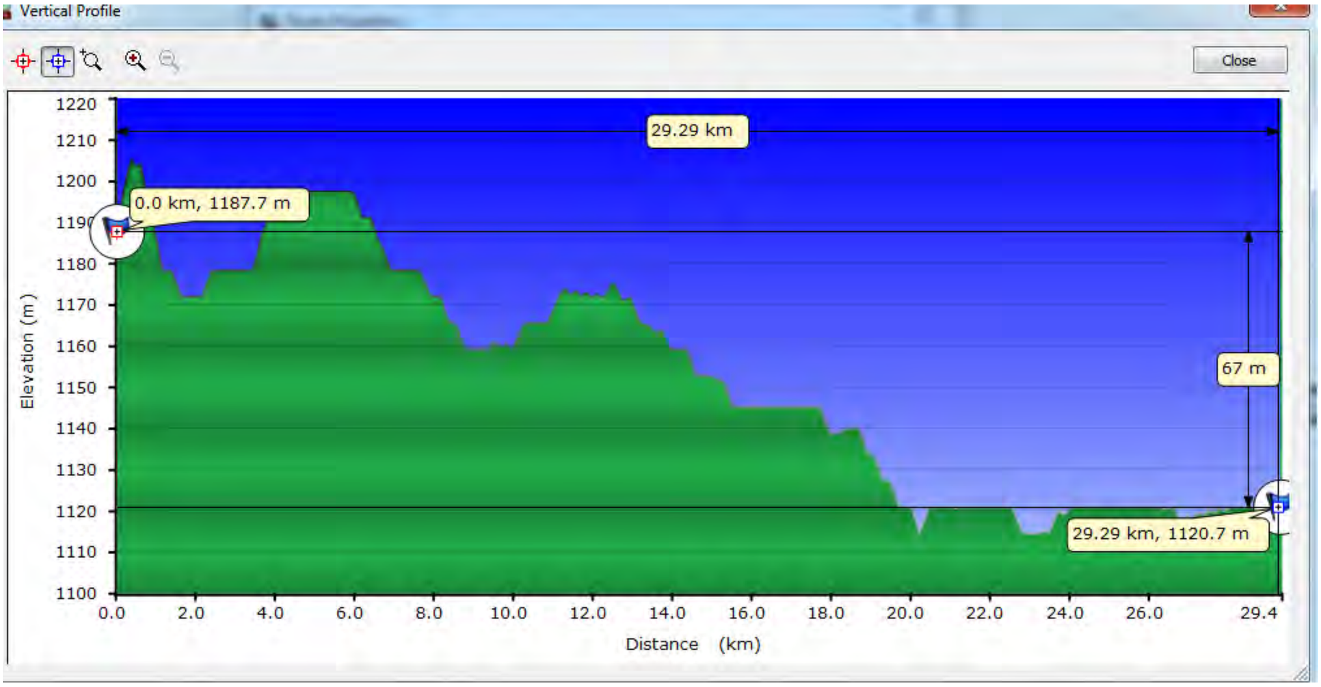


Figure 2: WTG 3 to SKA ID 1895

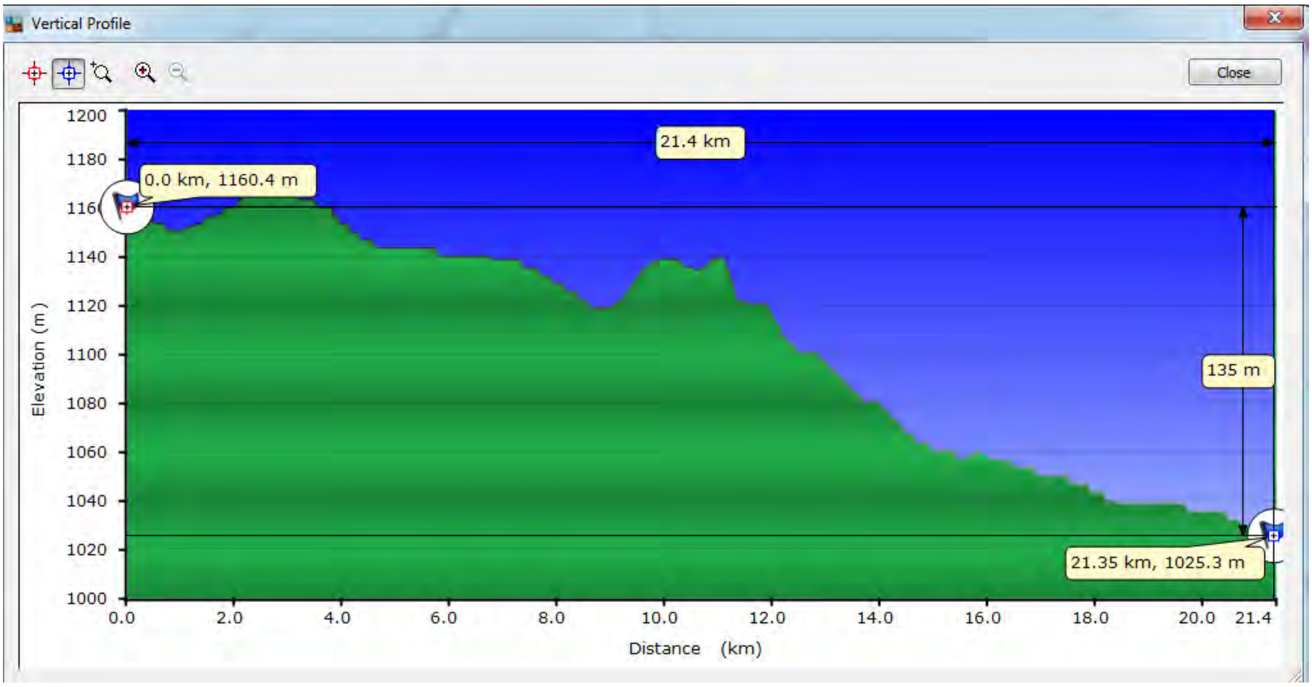


Figure 3: WTG 5 to SKA ID 1890

4.3 INPUT DATA

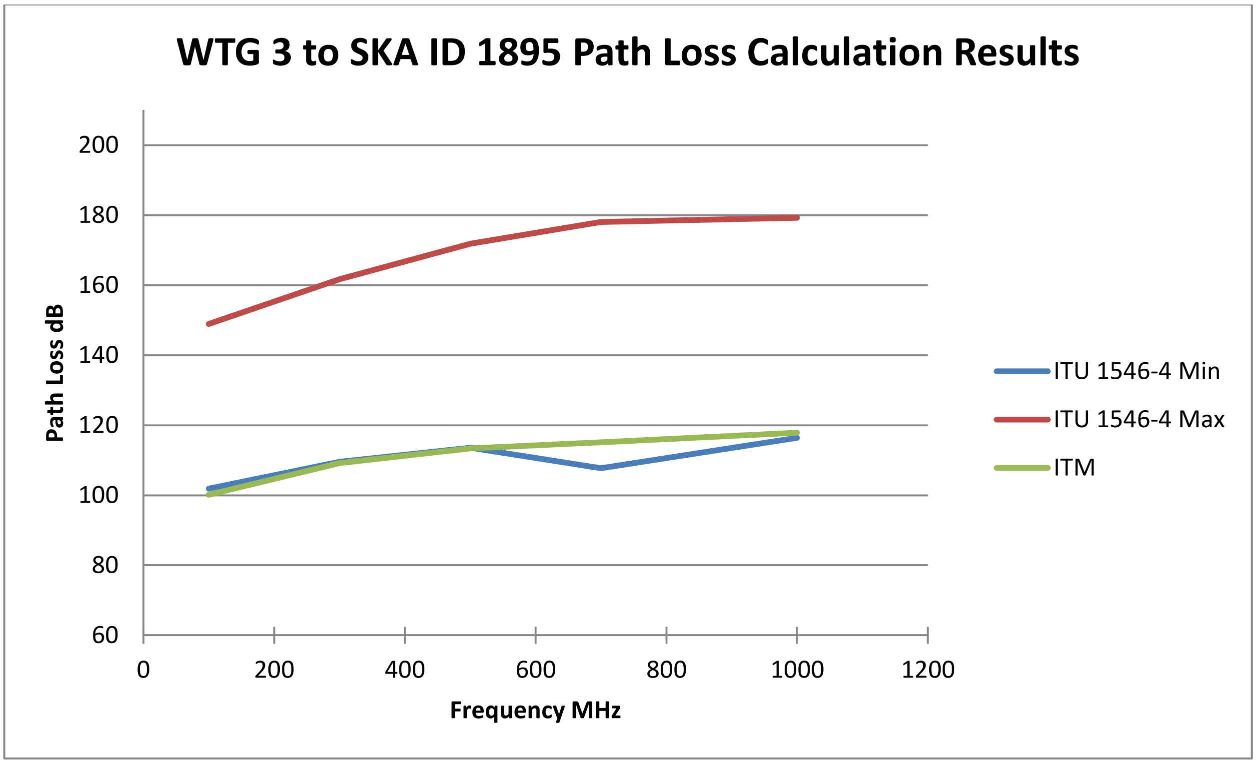
Parameter	Description	Quantity	Comment
Source/ Victim separation distance	WTG 3 to SKA ID 1895	29.4km	Figure 2 refers
Source/ Victim separation distance	WTG 5 to SKA ID 1890	21.4km	Figure 3 refers
Frequency	Frequencies assessed	100MHz, 300MHz, 500MHz, 1000MHz	Frequencies above 1GHz were not included in the

			calculations
TX Power	EN 55022 @ 10m	30 dBµV/m for >230MHz 37 dBµV/m for <230MHz	Based in the allowable emission limit for Class B equipment with a CE mark
SARAS	Protection level	dBm/Hz = -17.2708 log 10 (f) - 192.0714 for f<2GHz	Government Gazette 10 February 2012
Locations	WTG 3	29°53'28.0"S 22°31'46.9"E @1200m	Waypoint received from BioTherm Energy
Locations	WTG 5	30°01'26.8"S 22°32'52.4"E @1159.9m	Waypoint received from BioTherm Energy
Location	SKA ID 1890	29°56'35.70"S 22°22'18.01"E @1096m	Waypoint received from SKA SA (Pty) Ltd
Location	SKA ID 1895	29°42'18.75"S 22°18'48.41"E @1122m	Waypoint received from SKA SA (Pty) Ltd
Location	SKA ID 2348	30° 14' 23.9S" 22° 54' 44.8"E @1080m	Waypoint received from SKA SA (Pty) Ltd
Location	SKA S2 17	30° 15' 45.4"S 22° 13' 18.5"S @1052m	Waypoint received from SKA SA (Pty) Ltd
TX height	WTG 3 & WTG 5	100m	Nacelle height
RX height	All SKA receivers	15m	Height used for SKA receive horn

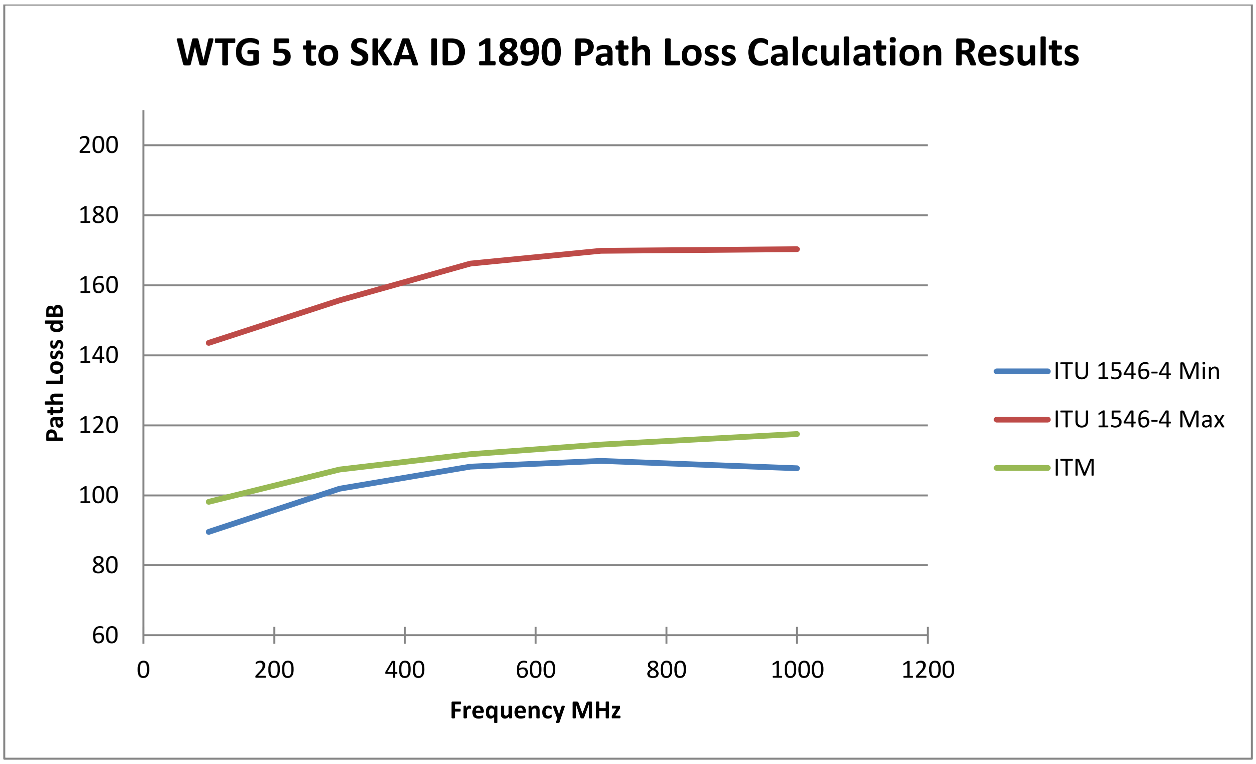
Table 1: Parameters used for calculations

4.4 PATH LOSS CALCULATIONS

The path loss was calculated using the parameters as specified in Table 1.



Graph 1: WTG 3 to SKA ID 1895 Path Loss Calculation result



Graph 2: WTG 5 to SKA ID 1890 Path Loss Calculation result

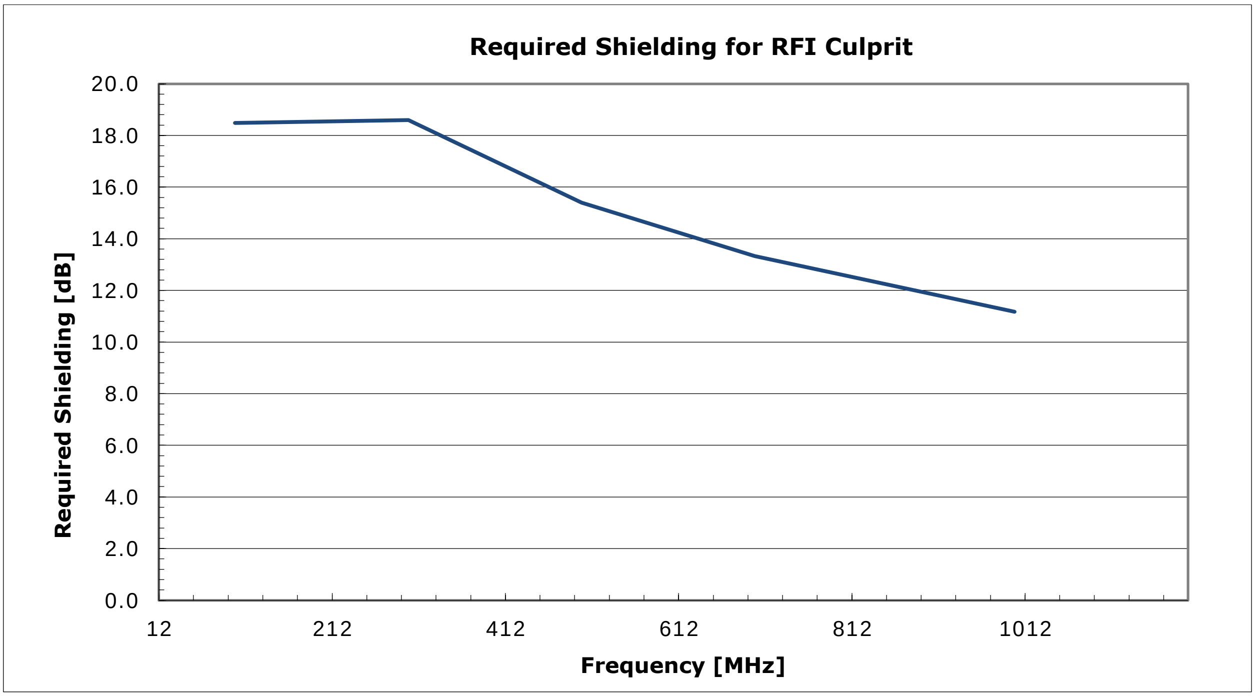
The bottom trace in Graph 1 and Graph 2 is the minimum attenuation of the electromagnetic emission due to the distance between WTG 3 and the SKA 1895 and WTG5 and the SKA 1890 antenna location as calculated with Monte Carlo based ITU 1546-4 path loss software.
In each calculation the ITM results is within the statistical minimum – maximum result of the ITU 1546-4 prediction model.
The minimum path loss calculated is expected between WTG 5 and SKA ID 1890 for the ITU 1546-4 due to the 21.43km separation distance.

A factor of 10 $\log_{10}$ N where N = the number of turbines to account for cumulative emissions is normally account for. For this project, the cumulative effect is already accounted for in the Gouda measurement and no additional cumulative effect factor is used.

5. ATTENUATION REQUIRED

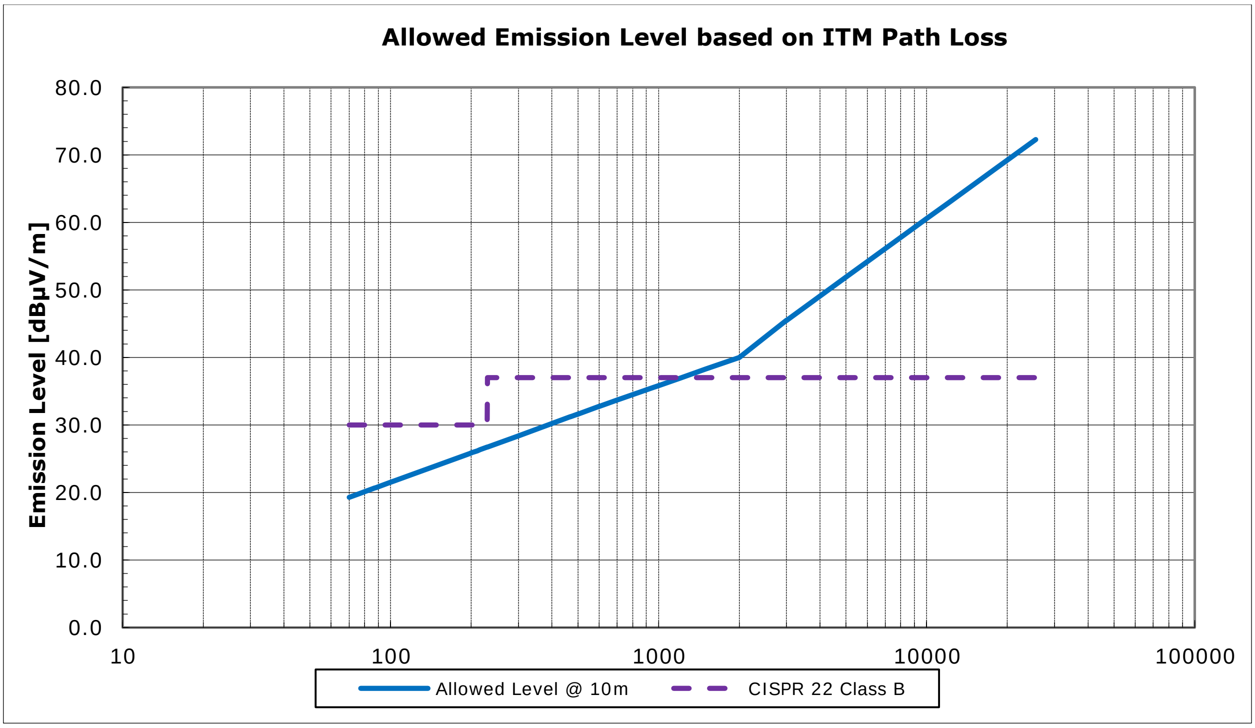
As the minimum path loss was calculated between WTG 5 and SKA ID 1890 with the ITU 1546-4 method, it was used for the calculations that follow.

Based on compliance of all equipment to EN55022 Class B additional attenuation of < 20dB will be required as shown in **Graph 3**. A 10 dB safety margin was added to the EN55022 Class B levels and the ITM path loss values were used for this calculation.



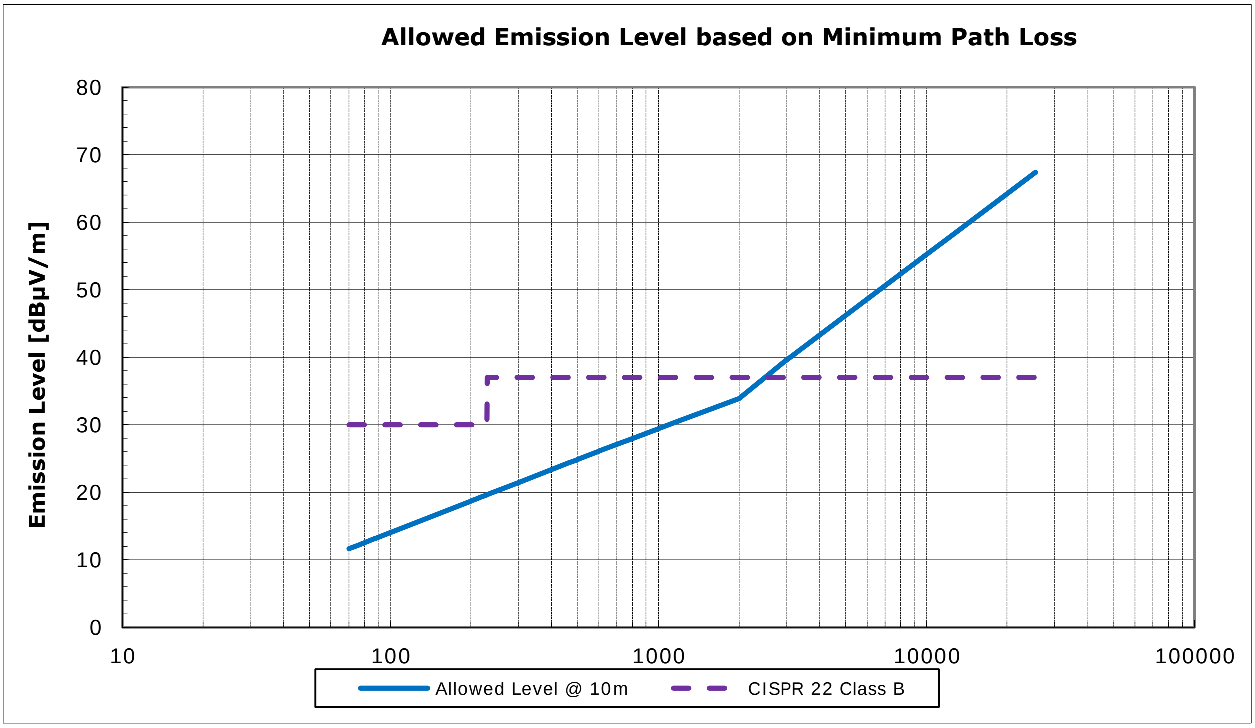
Graph 3: Required attenuation (ITM path loss values)

The maximum amplitude of radiated emissions referred to the CISPR test method (120kHz resolution bandwidth and 10m distance) based on the ITM path loss values is shown in Graph 4



Graph 4: Allowed levels based on ITM path loss values

The maximum amplitude of radiated emissions referred to the CISPR test method (120kHz resolution bandwidth and 10m distance) based on the statistical minimum path loss value of ITU-R P.1546-4 Land Path propagation model is shown in Graph 5.



Graph 5: Allowed level based on statistical minimum path loss values

6. MITIGATION

Measurements at the Gouda Windfarm were compromised by unexpected substation emissions and the high-site emissions, located <5km from the windfarm. The results do however show that required levels of 10 to 20 dB below the CISPR 22 Class B limit should be achievable.

7. CONCLUSION

Based on the current SKA location information, a first order impact analysis shows a possible interference scenario between the Aletta Windfarm and the nearest SKA installation at 21.43km separation distance . In order to negate the risk to an acceptable level, all equipment to be installed on site must comply with levels of 10 to 20dB below the EN 55022 Class B limit as the primary mitigation measure. Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the windfarm. Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances