Johann Lanz
Soil Scientist (Pri.Sci.Nat.)
Reg. no. 400268/12

Cell: 082 927 9018
Tel: 021 866 1518
e-mail: johann@johannlanz.co.za

PO Box 6209
Uniedal
7612
Stellenbosch
South Africa

AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR PROPOSED ITHEMBA WIND FARM AND ASSOCIATED INFRASTRUCTURE NEAR LOERIESFONTEIN, NORTHERN CAPE

SCOPING PHASE REPORT

Report by
Johann Lanz

18 January 2017

Johann Lanz
Professional profile

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

- **Soil Science Consultant** **Self employed** **2002 - present**

  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

- Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.
- I have conducted several recent research projects focused on conservation farming, soil health and carbon sequestration.
- I have project managed the development of soil nutrition software for Farmsecure Agri Science.

- **Soil Science Consultant** **Agricultural Consultors International (Tinie du Preez)** **1998 - end 2001**

  Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

- **Contracting Soil Scientist** **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

  Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

Specialist Declaration

I, Johann Lanz, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company: Johann Lanz – Soil Scientist

Professional Registration (including number): SACNASP Reg. no. 400268/12

Date: 18 January 2017

EXECUTIVE SUMMARY

The proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the proposed site is on land which is of extremely low agricultural potential, and which is only suitable as grazing land.

The key findings of this study are:

- Soils across the site are predominantly shallow, sandy soils on underlying rock or hard-pan carbonate, of the Coega, Mispah, Glenrosa and Askham soil forms.
- The major limitations to agriculture are the extremely limited climatic moisture availability and the poor soils.
- As a result of these limitations, the site is unsuitable for cultivation and agricultural land use is limited to low intensity grazing.
- The land capability is classified as Class 7 - non-arable, low potential grazing land. The site has a very low grazing capacity of 45 hectares per large stock unit.
- There are no agriculturally sensitive areas and no parts of the site need to be avoided by the development.
- The significance of all agricultural impacts is kept low by two important factors. The first is that the actual footprint of disturbance of the wind farm is very small in relation to the available grazing land. The second is the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing.
- Six potential negative impacts of the development on agricultural resources and productivity were identified as:
    - Loss of agricultural land use caused by direct occupation of land by the energy facilities' footprint.
    - Soil Erosion caused by alteration of the surface characteristics.
    - Generation of dust caused by alteration of the surface characteristics.
    - Loss of topsoil in disturbed areas, causing a decline in soil fertility.
    - Degradation of surrounding grazing land due to vehicle trampling.
    - Soil contamination from hydrocarbon spills during construction.
- Two potential positive impacts of the development on agricultural resources and productivity were identified as:
    - Generation of additional land use income through renting land for energy generation which makes a positive contribution to farming cash flow and thereby improves the financial sustainability of farming on site.
    - Increased security against stock theft due to the presence of the energy facility.
- All impacts were assessed as having low significance.
- The following mitigation measures were recommended:
    - Implement an effective system of storm water run-off control;
    - Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas;
    - Control dust through appropriate dust suppression methods;

    - Strip and stockpile topsoil before disturbance and re-spread it on the surface as soon as possible after disturbance;
    - Manage any sub-surface spoils from excavations in such a manner that they will not bury the topsoil of agricultural land;
    - Minimise road footprint and control vehicle access on designated roads only; and
    - Implement effective spillage and waste management system.
- Because of the low agricultural potential, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development.
- Despite any cumulative regional impact that may occur, it is preferable to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.
- There are no conditions resulting from this assessment that need to be included in the environmental authorisation.
- There is no difference and therefore no preference between the proposed alternatives, in terms of agricultural impacts.

Table of Contents

1 INTRODUCTION

Development of the Ithemba Wind Farm and associated infrastructure is proposed approximately 75 kilometres north of the town of Loeriesfontein in the Northern Cape Province (see Figure 1). It is anticipated that the wind farm will have a maximum generation capacity of up to 235 MW with up to 70 turbines. Infrastructure will include:

- Turbines with foundations;
- Hard standing areas for crane usage per turbine;
- Gravel surface internal access roads;
- Underground cabling laid generally alongside internal roads;
- Electrical grid connection infrastructure
- Operation and maintenance buildings;
- Fencing; and
- Temporary lay down areas;

The objectives of this study are to identify and assess all potential impacts of the proposed development on agricultural resources, including soils, and agricultural production potential; to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts; and to comparatively assess project alternatives to input into the ranking and determination of a preferred alternative that will be assessed in detail in the impact assessment phase. Johann Lanz was appointed by SiVEST as an independent specialist to conduct this Agricultural Impact Assessment.

2 TERMS OF REFERENCE

The terms of reference for the study fulfills the requirements for a soils and agricultural study as described in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011. The study applies an appropriate level of detail for the agricultural suitability and soil variation on site, which, because it is justified (see section 3.1), is less than the standardised level of detail stipulated in the above regulations.

The above requirements may be summarised as:

- Identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Describe the topography of the site.
- Describe the climate in terms of agricultural suitability.
- Summarise available water sources for agriculture.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.

- Describe the erosion, vegetation and degradation status of the land.
- Determine the agricultural potential across the site.
- Determine the agricultural sensitivity to development across the site.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

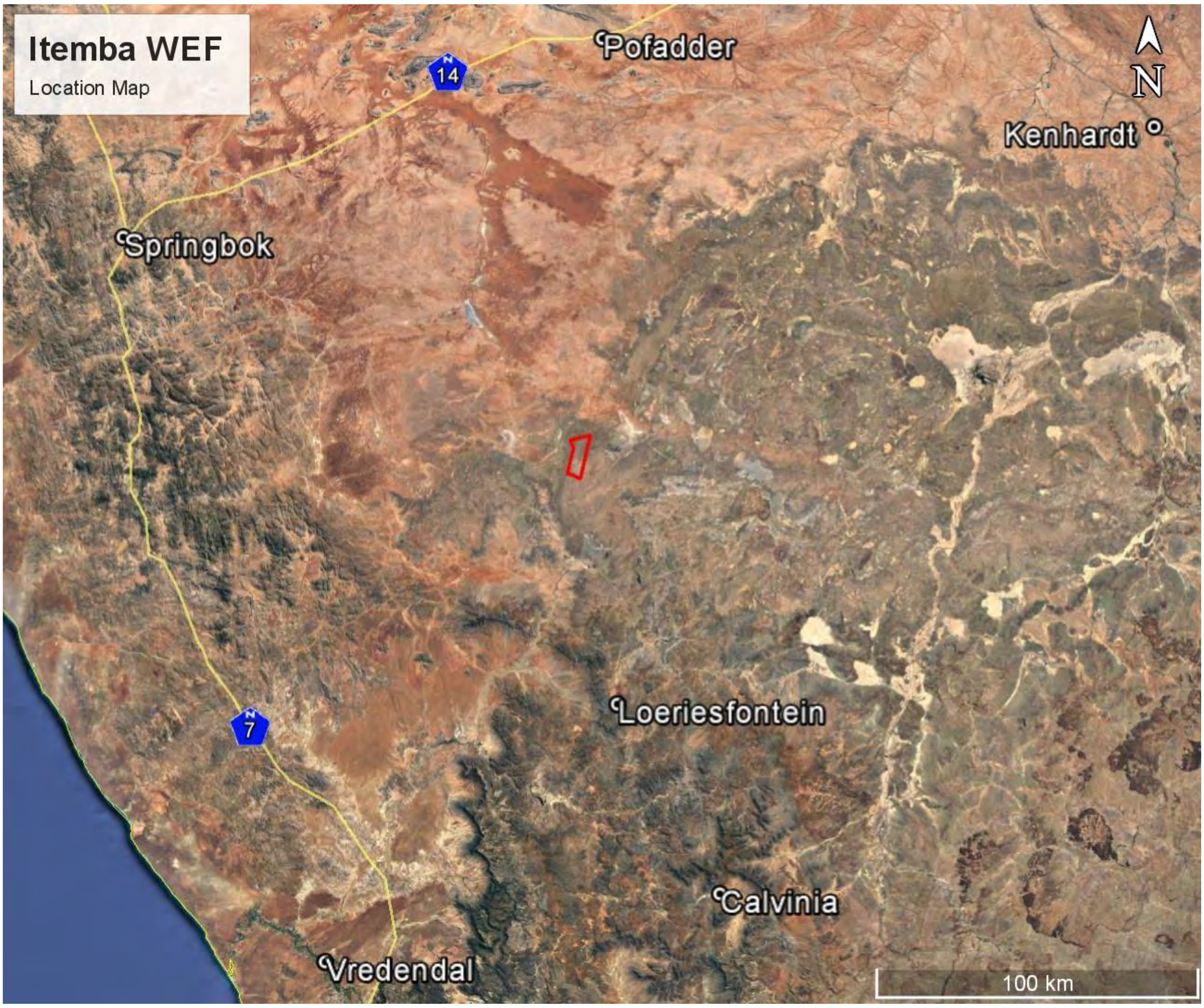

Figure 1. *Location map of the proposed Wind Energy Facility development area, north of the town of Loeriesfontein.*

The report also fulfils the requirements of Appendix 6 of the 2014 EIA Regulations (See Table 1).

Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R982	Addressed in the Specialist Report
• A specialist report prepared in terms of these Regulations must contain ◦ details of- ▪ the specialist who prepared the report; and	Title page

Requirements of Appendix 6 – GN R982	**Addressed in the Specialist Report**
▪ the expertise of that specialist to compile a specialist report including a curriculum vita;	CV within report
◦ a declaration that the specialist is independent in a form as may be specified by the competent authority;	At beginning of report
◦ an indication of the scope of, and the purpose for which, the report was prepared;	Section 1 and 2
◦ the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.1
◦ a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 3
◦ the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 6.8
◦ an identification of any areas to be avoided, including buffers;	Section 6.8
◦ a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 3
◦ a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
◦ a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 7 and 8
◦ any mitigation measures for inclusion in the EMPr;	Section 7
◦ any conditions for inclusion in the environmental authorisation;	Section 8
◦ any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Not in scoping phase report
◦ a reasoned opinion- ▪ as to whether the proposed activity or portions thereof should be authorised; and ▪ if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8 Section 7
◦ a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3.1
◦ a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
◦ any other information requested by the competent authority.	Not applicable

3 METHODOLOGY OF STUDY

3.1 Methodology for assessing soils and agricultural potential

The assessment was based largely on existing soil and agricultural potential data for the site. The source of this data was the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site available on Google Earth was also used for evaluation.

The AGIS data was supplemented by a field investigation. This was aimed at ground-proofing the AGIS data and achieving an understanding of specific soil and agricultural conditions, and the variation of these across the site. The field investigation involved a drive and walk over of the site using assessment of surface conditions and existing excavations and burrows. The field assessment was done on 2 November 2016.

Soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991).

It is my opinion that the level of soil mapping detail in the above DAFF requirements (see Section 2) is appropriate for arable land only. It is not appropriate for this site. Detailed soil mapping has little relevance to an assessment of agricultural potential in this environment, where the agricultural limitations are overwhelmingly climatic, soil conditions are generally poor, and cultivation potential is non-existent. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity constraints. Conducting a soil assessment at the stipulated level of detail would be very time consuming and be a waste of that time, as it would add no value to the assessment. The level of soil assessment that was conducted for this report (reconnaissance ground proofing of land type data) is considered more than adequate for a thorough assessment of all agricultural impacts.

An assessment of soils (soil mapping) and long term agricultural potential is in no way affected by the season in which the assessment is made, and therefore the fact that the assessment was done in summer has no bearing on its results.

The field investigation also included a visual assessment of erosion and erosion potential on site, taking into account a potential development layout.

Telephonic consultation was done with the land owners, Mr Albie Louw and Mr Nico Louw to get details of farming activities on the site.

3.2 Methodology for determining impact significance

All potential impacts were assessed in terms of the following criteria:

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 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.

4 ASSUMPTIONS, CONSTRAINTS AND LIMITATIONS OF STUDY

The field investigation for this assessment is considered more than adequate for the purposes of this study (see section 3.1) and is therefore not seen as a limitation.

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

The study makes the assumption that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.

There are no other specific constraints, uncertainties and gaps in knowledge for this study.

5 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act 70 of 1970 (SALA) and an application in this regard must be submitted to the National Department of Agriculture. This is required for long term lease, even if no subdivision is required. The protection and rehabilitation after disturbance of agricultural land is managed by the Conservation of Agricultural Resources Act, 43 of 1983 (CARA). No application is required in terms of CARA, as the EIA process covers the required aspects of this. The Land Use Planning Ordinance 15 of 1985 is also relevant. The Department of Agriculture reviews and approves applications in terms of these Acts according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.

6 BASELINE ASSESSMENT OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

This section is organised in sub headings based on the requirements of an agricultural study as detailed in section 2 of this report.

All the background data on soils and agricultural potential in this report has been obtained from the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

A satellite image of the site showing the development area is given in Figure 3. Photographs of site conditions are given in Figures 4 to 6.

6.1 Climate and water availability

Rainfall for the site is given as a very low 130 mm per annum (The World Bank Climate Change Knowledge Portal, undated). The average monthly distribution of rainfall is shown in Figure 2. One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. This parameter largely controls what rain fed agriculture (including grazing) is possible within a given environment. Moisture availability is classified into 6 categories across the country (see Table 2). The site falls into the driest 6th category, which is labelled as a very severe limitation to agriculture.

There are wind pumps with stock watering points in several places across the site. Water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.

Table 2. The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	Moisture availability (Rainfall/0.25 PET)	Description of agricultural limitation
C1	>34	None to slight
C2	27-34	Slight
C3	19-26	Moderate
C4	12-18	Moderate to severe
C5	6-12	Severe
C6	<6	Very severe

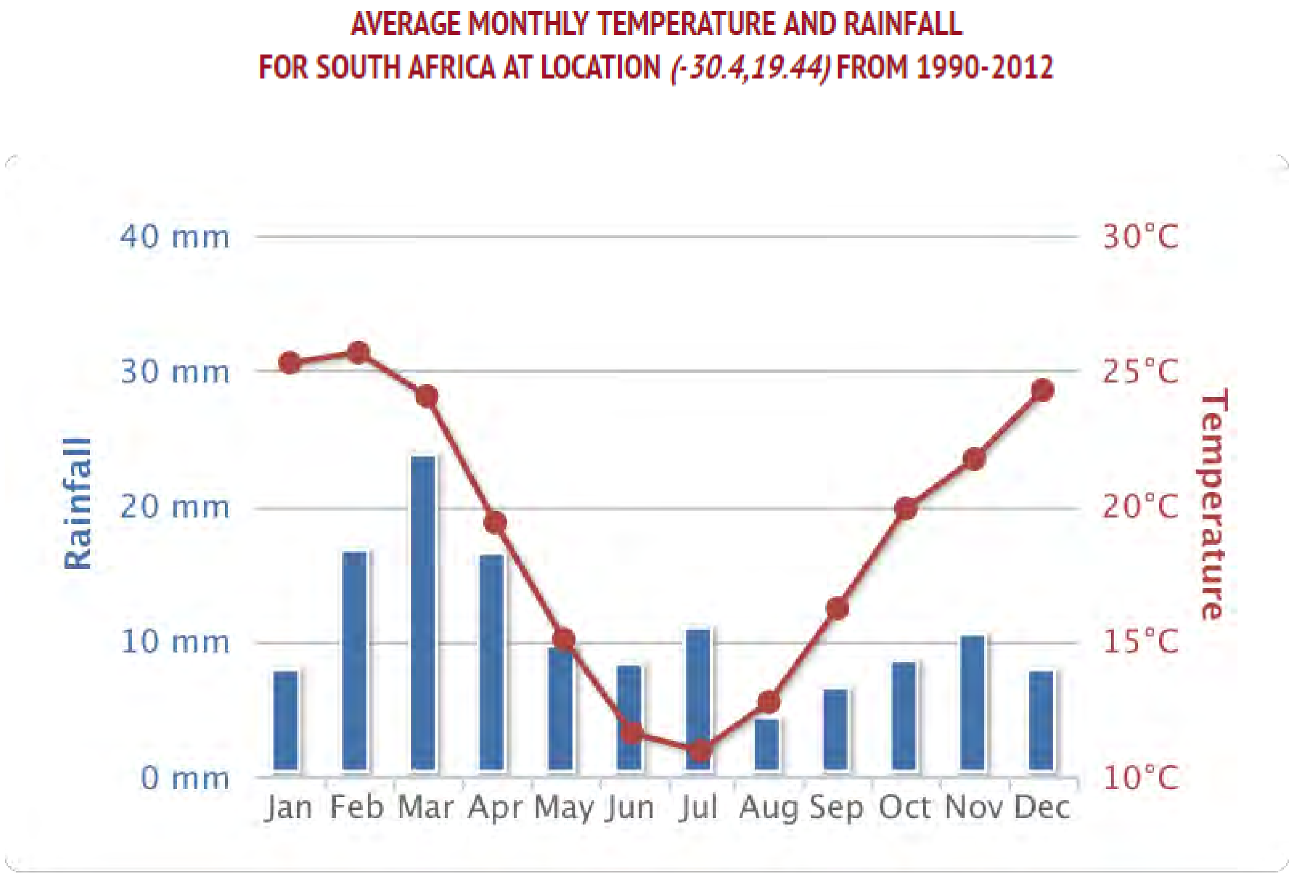

Figure 2. *Average monthly temperature and rainfall for the site (The World Bank Climate Change Knowledge Portal, undated).*

6.2 Terrain, topography and drainage

The proposed wind farm is located on a terrain unit of plains with some relief at an altitude of between 900 and 950 metres. Slopes across the site are almost entirely less than 2% but may be greater in a few isolated spots.

The underlying geology is shale of the Ecca and Dwyka Groups of the Karoo Supergroup with tillite of the Dwyka Group and dolerite intrusions.

No perennial drainage features occur on the site. There are some very indistinct, intermittent drainage lines that may flow temporarily after heavy rains.

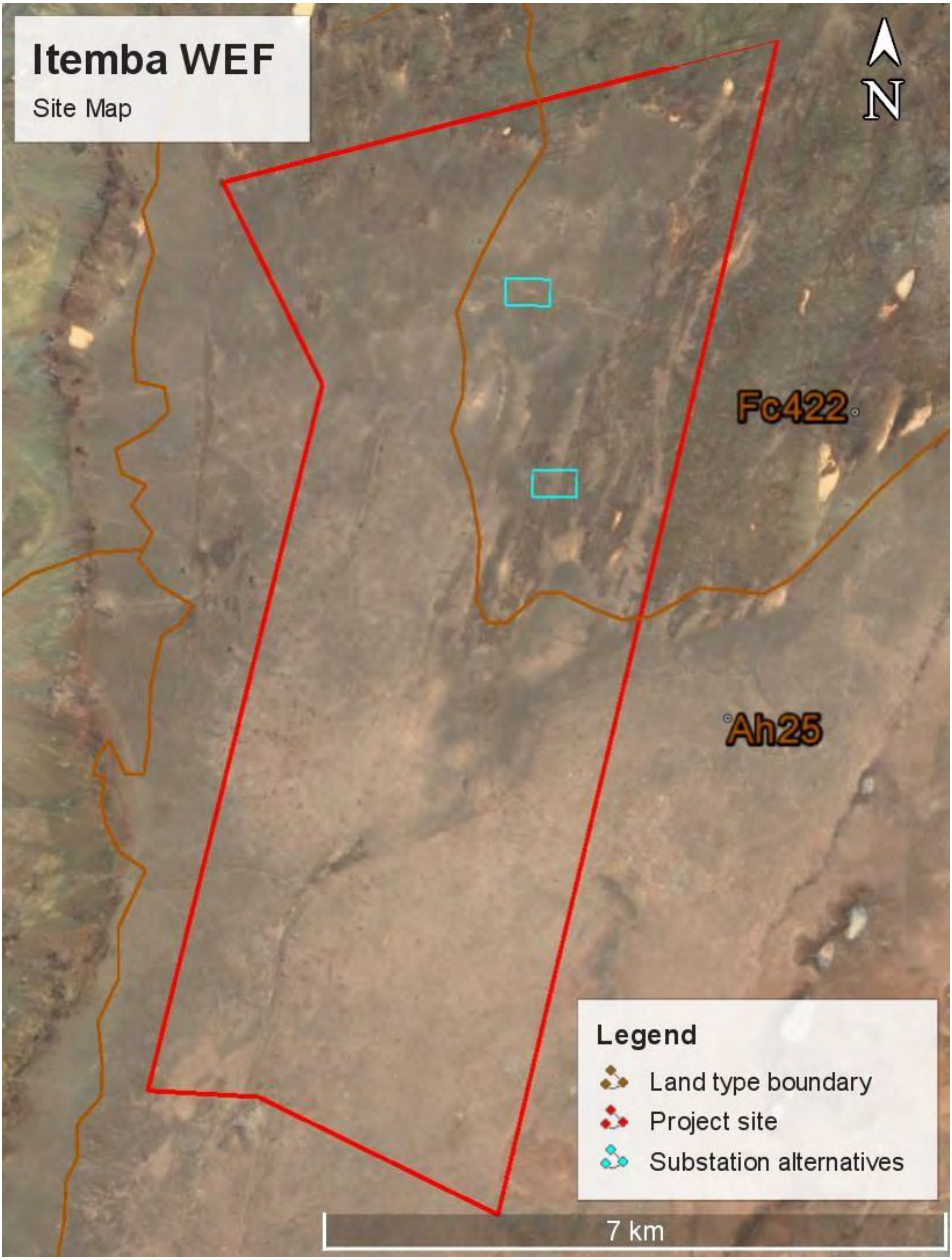

Figure 3. *Satellite image map of the site showing the development area.*

6.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. There are two land types across the study area, namely Ah25 and Fc422 (see Figure 3). Soils on these land types are similar and are predominantly shallow, sandy soils on underlying rock or hard-pan carbonate. The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land types is provided in the Appendix in Table A1. The field investigation confirmed the occurrence of shallow, sandy soils on underlying rock or hard-pan carbonate across the entire site. The predominant soil forms are Coega, Mispah, Glenrosa and Askham.

Figure 4. *Photograph showing typical landscape and veld conditions on the site (land type Fc422).*

Figure 5. *Photograph showing typical landscape and veld conditions on the site (land type Ah25).*

Figure 6. *Photograph showing site conditions with example of dolerite outcrops that occur on site.*

6.4 Agricultural capability

Land capability is defined as the combination of soil suitability and climate factors. The area has a land capability classification, according to the 8 category scale of Class 7 which is non-arable, low potential grazing land. The limitations to agriculture are the extreme aridity and lack of access to water as well as the predominantly shallow, rocky soils. Due to these constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is given on AGIS as very low, at 45 hectares per animal unit. This is amongst the lowest grazing capacity areas in the country.

6.5 Land use and development on and surrounding the site

The farm is located in a sheep farming agricultural region, and grazing (sheep and some cattle) is the only agricultural land use on the site and surrounds. There is no agricultural infrastructure in the study area, apart from fencing into camps and wind pumps with stock watering points. There is an abandoned and slightly derelict farmstead in the central part of the site.

6.6 Status of the land

The vegetation classification for the site is Bushmanland Basin Shrubland. The vegetation is grazed and very sparse due to a number of years of low rainfall. Natural surface erosion, typical of sparsely vegetated, arid environments, is active but there is no evidence of excessive, accelerated erosion, or other land degradation. The land is classified as having a low to moderate water erosion hazard (class 5), but it is classified as highly susceptible to wind erosion (class 1a and 1d) because sands, as a soil textural class, are dominant.

6.7 Possible land use options for the site

Due to the extreme aridity constraints as well as the poor soils, agricultural land use is restricted to low intensity grazing only.

6.8 Agricultural sensitivity

Agricultural potential and conditions are very uniform across the site and the choice of placement of facility infrastructure, including access roads, and transmission lines therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the study area. From an agricultural point of view, no parts of the site need to be avoided by the development and there are no required buffers.

7 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

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

- Occupation of the site by the footprint of the facility; and
- Construction activities that disturb the soil profile and vegetation, for example for levelling, excavations, etc.

The significance of all agricultural impacts is kept low by two important factors. The first is that the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions (will be <2% of the surface area). All agricultural activities will be able to continue unaffected on all parts of the farm other than the small development footprint for the duration of and after the project. The second is the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. These factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

From an agricultural impact perspective, land on this site is ideally suited to renewable energy development because of its very limited production potential. It is agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to such land.

The following are identified as potential impacts of the development on agricultural resources and productivity, and are assessed in table format.

7.1 Impacts associated with all phases of the development - construction, operational, and decommissioning

Environmental parameter: agricultural land (grazing)		
Impact 1: Loss of agricultural land use, caused by direct occupation of land by footprint of development infrastructure and having the effect of taking affected portions of land out of agricultural production (grazing). This applies to the direct footprint of the development which comprises the turbine foundations, hard standing areas, roads and the footprint of other infrastructure. This represents only a small proportion of the land surface area. During the construction phase there is somewhat more disturbance due to temporary lay down areas.		
	Pre-mitigation	**Post-mitigation**
Extent	1 Site	n/a
Probability	4 Definite	n/a
Reversibility	2 Partly reversible	n/a
Irreplaceable loss	2 Marginal	n/a

Duration	3 Long term	n/a
Cumulative effect	2 Low	n/a
Intensity	1 Low	n/a
Significance	14 Low negative	n/a
Mitigation measures: none possible		

Environmental parameter: farm economic sustainability		
Impact 2: Generation of additional land use income through rental to energy facility. This is a positive impact for agriculture. It will provide the farming enterprises on site with increased cash flow and rural livelihood, and thereby improve their financial sustainability.		
	Pre-mitigation	**Post-mitigation**
Extent	1 Site	n/a
Probability	4 Definite	n/a
Reversibility	1 Completely reversible	n/a
Irreplaceable loss	1 No loss	n/a
Duration	3 Long term	n/a
Cumulative effect	1 Negligible	n/a
Intensity	1 Low	n/a
Significance	11 Low positive	n/a
Optimization: none possible		

Environmental parameter: soil		
Impact 3: Erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources. Risk of water erosion is low, but the area is susceptible to wind erosion.		
	Pre-mitigation	**Post-mitigation**
Extent	1 Site	1 Site
Probability	3 Probable	2 Possible
Reversibility	2 Partly reversible	2 Partly reversible
Irreplaceable loss	2 Marginal	2 Marginal
Duration	3 Long term	3 Long term
Cumulative effect	1 Negligible	1 Negligible

Intensity	2 Medium	1 Low
Significance	24 Low negative	11 Low negative
Mitigation measures: • Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there. This should be in place and maintained during all phases of the development. • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.		

Environmental parameter: farm security		
Impact 4: Increased security against stock theft due to the presence of the energy facility and its personnel.		
	Pre-mitigation	**Post-mitigation**
Extent	1 Site	n/a
Probability	3 Probable	n/a
Reversibility	1 Completely reversible	n/a
Irreplaceable loss	1 No loss	n/a
Duration	3 Long term	n/a
Cumulative effect	1 Negligible	n/a
Intensity	1 Low	n/a
Significance	10 Low negative	n/a
Optimization measures: none possible.		

7.2 Impacts associated only with the construction phase of the development

Environmental parameter: soil		
Impact 5: Loss of topsoil caused by poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation. The very low proportion of surface area that is likely to be impacted, reduces the significance of this impact.		
	Pre-mitigation	Post-mitigation
Extent	1 Site	1 Site

Probability	3 Probable	2 Possible
Reversibility	2 Partly reversible	2 Partly reversible
Irreplaceable loss	2 Marginal	2 Marginal
Duration	3 Long term	3 Long term
Cumulative effect	1 Negligible	1 Negligible
Intensity	2 Medium	1 Low
Significance	24 Low negative	11 Low negative
Mitigation measures: If an activity will mechanically disturb below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Erosion must be controlled where necessary on topsoiled areas.		

Environmental parameter: veld vegetation (grazing)		
Impact 6: Degradation of veld vegetation beyond the direct development footprint caused by trampling due to vehicle passage, and deposition of dust.		
	Pre-mitigation	Post-mitigation
Extent	1 Site	1 Site
Probability	2 Possible	1 Unlikely
Reversibility	2 Partly reversible	2 Partly reversible
Irreplaceable loss	2 Marginal	2 Marginal
Duration	2 Medium term	2 Medium term
Cumulative effect	1 Negligible	1 Negligible
Intensity	1 Low	1 Low
Significance	10 Low negative	9 Low negative
Mitigation measures: 1. Minimize road footprint and control vehicle access on approved roads only. 2. Control dust as per standard construction site practice.		

Environmental parameter: air quality

Impact 7: Dust generation is likely to result from disturbance of surface and surface vegetation cover, and consequent exposure to wind erosion. Dust has a negative impact on surrounding veld vegetation, animals and humans.		
	Pre-mitigation	Post-mitigation
Extent	1 Site	1 Site
Probability	2 Possible	1 Unlikely
Reversibility	2 Partly reversible	2 Partly reversible
Irreplaceable loss	2 Marginal	2 Marginal
Duration	2 Medium term	2 Medium term
Cumulative effect	1 Negligible	1 Negligible
Intensity	1 Low	1 Low
Significance	10 Low negative	9 Low negative
Mitigation measures: Control dust as per standard construction site measures which may include damping down with water or other appropriate and effective dust control measures. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site.		

Environmental parameter: soil		
Impact 8: Soil contamination can occur from hydrocarbon spillages from construction activities. The very low proportion of surface area that is likely to be impacted and its low consequence for farming activities, reduces the significance of this impact.		
	Pre-mitigation	Post-mitigation
Extent	1 Site	1 Site
Probability	2 Possible	1 Unlikely
Reversibility	2 Partly reversible	2 Partly reversible
Irreplaceable loss	2 Marginal	2 Marginal
Duration	2 Medium term	2 Medium term
Cumulative effect	1 Negligible	1 Negligible
Intensity	1 Low	1 Low
Significance	10 Low negative	9 Low negative
Mitigation measures: Implement effective spillage and waste management system.		

7.3 Cumulative impact

The cumulative regional impact is a loss of agricultural land, as a result of the sum of surrounding developments, of which there are several (see Figure 7 and Table 3). Due to the extremely limited agricultural potential of all land in the area, predominantly as a result of climatic limitations, and the fact that there is no particular scarcity of such land in South Africa, the cumulative impact is assessed as being of low significance. Because of the very low agricultural potential of the site considered in this report, its contribution to any cumulative impact is also low.

Furthermore it is preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development, elsewhere in the country.

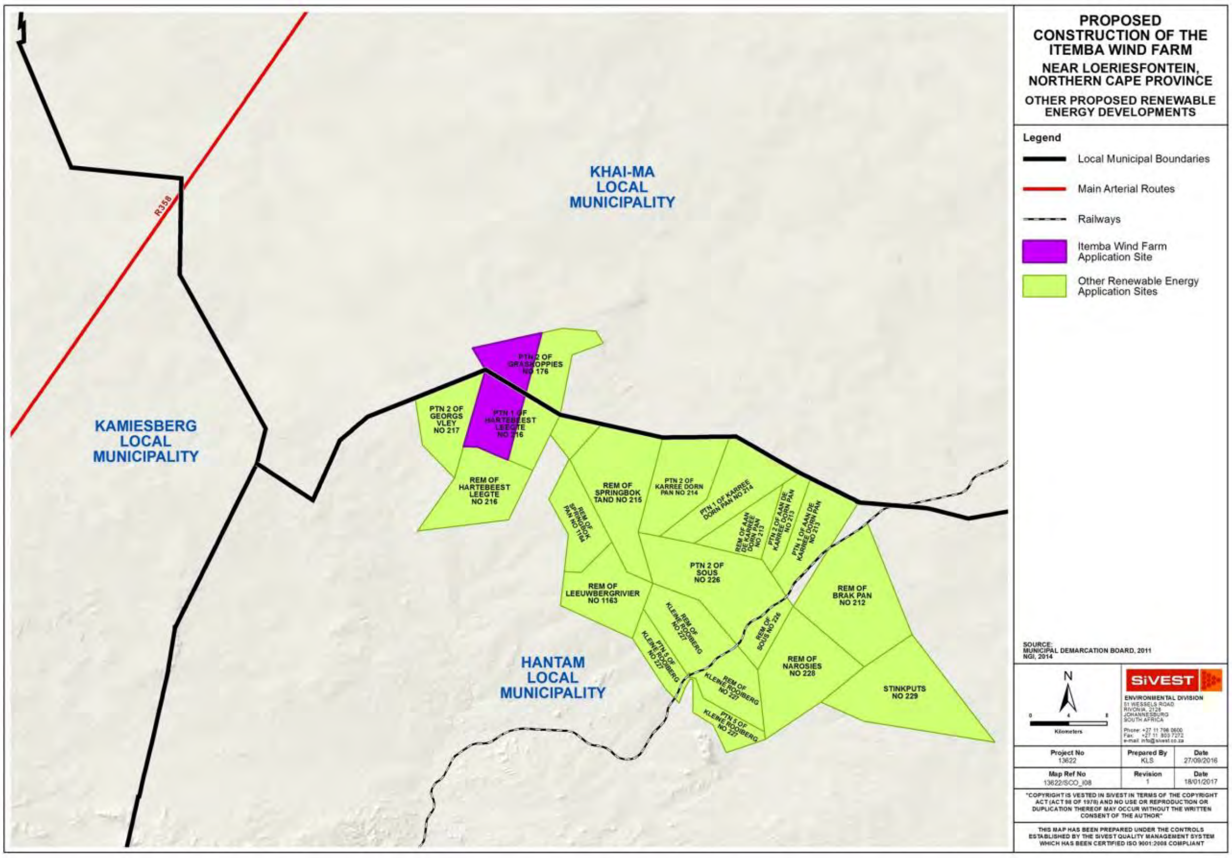

Figure 7. *Map showing all proposed renewable energy developments in proximity to the development considered in this report.*

Table 3. Detail of all proposed renewable energy developments in proximity to the development considered in this report.

Development	Current status of EIA/development	Proponent	Capacity	Farm details
Khobab Wind Farm	Under Construction	Mainstream Renewable Power	140MW	Pt 2 of Farm Sous 226
Loeriesfontein 2 Wind Farm	Under Construction	Mainstream Renewable Power	140MW	Pt 1 & 2 of Farm Aan de Karree Doorn Pan 213
Wind farm	Environmental Authorisation issued	Mainstream	50MW	Pt 1 of Farm Aan

Development	Current status of EIA/development	Proponent	Capacity	Farm details
		Renewable Power		de Karree Doorn Pan 213
PV Solar Energy Facility	Environmental Authorisation issued	Mainstream Renewable Power	100MW	Portion 2 of Farm Aan de Karree Doorn Pan 213
Hantam PV Solar Energy Facility	Environmental Authorisation issued / Approved under RE IPPPP	Solar Capital (Pty) Ltd	Up to 525MW	RE of Farm Narosies 228
PV Solar Power Plant	Environmental Authorisation issued	BioTherm Energy	70MW	Pt 5 of Farm Kleine Rooiberg 227
Dwarsrug Wind Farm	Environmental Authorisation issued	Mainstream Renewable Power	140MW	Remainder of Brak Pan 212 Stinkputs 229
Kokerboom 1 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	240MW	• Remainder of the Farm Leeuwbergrivier No. 1163 • Remainder of the Farm Kleine Rooiberg No. 227
Kokerboom 2 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	240MW	• Remainder of the Farm Springbok Pan No. 1164 • Remainder of the Farm Springbok Tand No. 215

7.4 Comparative assessment of alternatives

The only project alternatives being considered at this stage are two alternative locations for the substation. There are no significant differences in terms of agricultural impact between these proposed alternatives This is largely due to the low agricultural impacts associated with the development, and the fact that agricultural conditions are largely uniform across the area. There is therefore no preference between the proposed alternatives, in terms of agricultural impacts. The comparative assessment of these alternatives is tabled below.

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
On-site Substation Option 1	**NO PREFERENCE**	Impact is low with no significant differences between the locations
On-site Substation Option 2	**NO PREFERENCE**	Impact is low with no significant differences between the locations

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

The no-go alternative anticipates changes to the agricultural environment that would occur in the absence of the proposed development. Potential such changes are that due to continued low rainfall in the area in addition to other economic and market pressures on farming, the agricultural enterprises will be under increased pressure in terms of economic viability.

Because of the comparative economic impacts between the no-go and the development, the development is the preferred alternative.

8 CONCLUSIONS

The Ithemba Wind Farm is located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the footprint of disturbance of the development will only impact agricultural land which is of extremely low agricultural potential and is unsuitable for cultivation.

The significance of all agricultural impacts is kept low by two important factors. The first is that the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions (likely to be <2% of the surface area). All agricultural activities will be able to continue unaffected on all parts of the farm other than the small development footprint for the duration of and after the project. The second is the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. These factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

There are no agriculturally sensitive areas that need to be avoided by the development. There are no conditions resulting from this assessment that need to be included in the environmental authorisation.

Because of the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development.

There is no difference and therefore no preference between the proposed alternatives, in terms of agricultural impacts.

No additional investigation of agricultural issues is required for the Environmental Impact

Assessment of the proposed development.

9 REFERENCES

Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.

Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.

Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

The World Bank Climate Change Knowledge Portal available at http://sdwebx.worldbank.org/climateportal/

APPENDIX 1: SOIL DATA

Table A1. Land type soil data for the site.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ah25	7	Hutton	5-15	3-6	4-10	ca, R	34
		Clovelly	5-15	3-6	4-10	ca, R	27
		Glenrosa	5-15	3-6	4-10	so, ca	10
		Mispah	10-20	3-6		ca, R	8
		Rock outcrop	0			R	8
		Swartland	15-35	5-10	25-35	so	8
		Dundee	>100	3-6	4-10	R	6
Fc422	7	Rock outcrop	0			R	24
		Mispah	1-15	3-6		ca	14
		Clovelly	15-40	6-10	6-15	ca	12
		Oakleaf / Dundee	50->120	10-45	7-46		10
		Glenrosa	15-35	6-10	10-15	R, so	10
		Oakleaf	20-40	6-15	10-15	ca, R, so	8
		Hutton	15-40	6-10	6-15	ca	8
		Mispah	1-10	5-8		R, ca	8
		Katspruit	30-60	6-15	10-30	ca, R	4

Land capability classes: 7 = non-arable, low potential grazing land;

Depth limiting layers: R = hard rock; ca = hardpan carbonate; so = partially weathered bedrock.