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AGRICULTURAL IMPACT ASSESSMENT FOR HIGHLANDS WIND ENERGY FACILITIES NEAR SOMERSET EAST EASTERN CAPE

BASIC ASSESSMENT REPORT

Report by
Johann Lanz

Prepared for
Arcus Consulting
Cape Town

August 2018

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.

- **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

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Highlands Wind Energy Facilities and associated infrastructure including grid connection infrastructure

Specialist:	Private Soil Science Consultant	
Contact person:	Johann Lanz	
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Professional affiliation(s) (if any)	South African Council for Natural Scientific Professions; Soil Science Society of SA	

Project Consultant:	Arcus Consultancy Services South Africa (Pty) Ltd	
Contact person:	Anja Albertyn	
Postal address:	Office 220, Cube Workspace, Long Street cnr Hans Strijdom Avenue, Cape Town	
Postal code:	8001	Cell: 076 265 8933
Telephone:	021 412 1529	Fax:
E-mail	highlands@arcusconsulting.co.za	

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:

Johann Lanz – Soil Scientist (sole proprietor)
Name of company (if applicable):

28 August 2018
Date:

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EXECUTIVE SUMMARY

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

The key findings of this study are:

- Soils of the proposed project area are predominantly very shallow, clay-rich, reasonably drained soils on underlying rock. Dominant soil forms are Glenrosa and Swartland.
- The major limitations to agriculture are the shallow, rocky soils and the limited climatic moisture availability.
- As a result of these limitations, the study area is unsuitable for cultivation and agricultural land use is limited to grazing.
- The proposed project area is classified with predominant land capability evaluation values of 5-6. Land capability values go as low as 1 on parts of the site. These are low land capabilities, unsuitable for the production of cultivated crops.
- Small patches of previously cultivated land were designated as having high agricultural sensitivity, and should be avoided by the footprint of the development. The assessed development layout does avoid all of these areas.
- 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 constitutes only a very small proportion of the available grazing land. The second is the fact that the proposed site is on land of limited agricultural potential that is only viable for grazing.
- Three potential negative impacts of the development on agricultural resources and productivity were identified as:
  - Loss of agricultural land use on the minimal footprint of the development caused by direct occupation by the development infrastructure;
  - Soil degradation due to erosion and topsoil loss from disturbance;
  - Cumulative regional loss of agricultural land use.
- One potential positive impact of the development on agricultural resources and productivity was identified as:
  - Generation of additional land use income from wind farm, which will improve cash flow and financial sustainability of farming enterprises on site.
- The impacts are identical for the three different wind farm components, and are identical for the 3 different electrical grid connection components.
- Impacts are also identical for the different alternative power line routes, and one route is therefore not preferred over another from an agricultural impact point of view.
- All impacts were assessed as having low significance after mitigation.
- Recommended mitigation measures include implementation of an effective system of storm water run-off control; the maintenance of vegetation cover to mitigate erosion; and topsoil stripping and re-spreading to mitigate loss of topsoil.

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

1 INTRODUCTION

WKN Windcurrent South Africa Pty (Ltd) are proposing the Highlands Wind Energy Facilities and associated infrastructure including grid connection near the town of Somerset East in the Eastern Cape Province (see Figure 1). This is located within the Cookhouse Renewable Energy Development Zone (REDZ). The development is distributed over an area of approximately 9,000 hectares, but will only occupy an actual footprint of approximately 2% of this surface area. There are three development phases, Highlands North, Central and South, each with its separate, associated electrical grid connection infrastructure, making a total of six components for environmental authorisation.

Figure 1. Location map of the Highlands WEF, west of Somerset East.

The three wind farm components will each comprise:

- Turbines with foundations (17 in North; 14 in Central; 18 in South);
- Hard standing areas for crane usage per turbine;
- Internal gravel roads linking turbine locations.
- On-site substation (only 1 or 2 of the proposed total of 4 substations for the 3 projects will be constructed);
- Cabling between turbines will largely follow the road infrastructure where possible, and

will be either overhead, or underground.

- An existing access road may require upgrading as part of the Central and South applications.

The three electrical grid connection components will each comprise:

- An overhead 66 kV or 132 kV line with a 31 metre servitude between the on-site substation and on-site Eskom transmission line. The maximum length will be North 5km; Central 8km; South 20km.

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, and to provide recommended mitigation measures and rehabilitation guidelines for all identified impacts. Johann Lanz was appointed by Arcus Consultancy Services as an independent specialist to conduct this Agricultural Impact Assessment.

2 TERMS OF REFERENCE

The following terms of reference apply to this study:

The report will fulfil the terms of reference for an agricultural study as set out 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, with an appropriate level of detail for the agricultural suitability and soil variation on site (less than the standardised level of detail stipulated in the above regulations is justified by the low agricultural potential of the proposed site and its inclusion within a REDZ – see section 3.1). DEA's requirements for an agricultural study are taken directly from this document, but use an older version of the document and not the most recent version, which was updated in 2011.

The report will also fulfil the requirements of Appendix 6 of the 2014 EIA Regulations (as amended). 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 climate as it pertains to agricultural potential
- Summarise available water sources for agriculture
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Determine and map, if there is variation, the agricultural potential across the site.
- Determine and map the agricultural sensitivity to development across the site, including any no-go areas.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation

guidelines for all identified impacts.

Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations (as Amended)

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	**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 the expertise of that specialist to compile a specialist report including a curriculum vitae;	 Title page Following Title page
a declaration that the specialist is independent in a form as may be specified by the competent authority;	Following CV
an indication of the scope of, and the purpose for which, the report was prepared;	Sections 1 & 2
an indication of the quality and age of base data used for the specialist report;	Section 3.1
a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 5.5, 5.6, 6.2 & 6.4
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 inclusive of equipment and modelling used;	Section 3
details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5.8 & Figure 2
an identification of any areas to be avoided, including buffers;	Section 5.8
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 2
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 or activities;	Section 6
any mitigation measures for inclusion in the EMPr;	Section 6
any conditions for inclusion in the environmental authorisation;	Section 7
any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Not applicable
a reasoned opinion- whether the proposed activity, activities or portions thereof should be authorised; regarding the acceptability of the proposed activity or activities and if the opinion is that the proposed activity, activities 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 7 Section 7 Section 6
a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable

3 METHODOLOGY OF STUDY

3.1 Methodology for assessing soils and agricultural potential

The pre-fieldwork assessment was based on existing data. Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002 (DAFF, 2002). It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.

Soils are described in this data set according to an older version of the South African soil classification system, as documented in soil Working Group (1991). It is a two tier system of classification. Soil forms are the first level of division. All soil forms are given a South African place name. Soils are divided into forms based on the sequence of diagnostic soil horizons in the soil profile. A particular sequence, defines a particular soil form, for example A horizon – Red apedal B horizon is a Hutton soil form and A horizon – Yellow-brown apedal B horizon – Hard plinthic B horizon is a Glencoe soil form.

Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries (DAFF, 2017).

Satellite imagery of the study area, available on Google Earth (historic and current), was also used for the assessment.

The existing data was supplemented by a field investigation. This was aimed at ground-proofing the 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, topography and existing exposures. The field assessment was done on 13 February 2018, during summer. 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 the timing of the assessment therefore has no bearing on its results.

The field investigation applied an appropriate level of detail for the agricultural suitability on site and for the level of impact of the proposed development on agricultural land. A detailed soil survey, as per the requirement in the above document, is appropriate for a significant footprint of impact on arable land. It is not appropriate for this site, where soil and climate constraints make cultivation non-viable. Conducting a soil survey at the required level of detail would be very time consuming but would add no value to the impact 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.

The field investigation included a visual assessment of erosion and erosion potential on site.

Information regarding agricultural activity on the site was obtained in discussion with one of the farmers, Mr Zirk Jordaan.

3.2 Methodology for determining impact significance

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

Criteria	**Rank**		
	Low	*Medium*	*High*
Intensity	Minor deterioration in land capability. Soil alteration resulting in a low negative impact on one of the other environments (e.g. ecology).	Partial loss of land capability. Soil alteration resulting in a moderate negative impact on one of the other environments (e.g. ecology).	Complete loss of land capability. Soil alteration resulting in a high negative impact on one of the other environments (e.g. ecology).
Extent	Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
Duration	Quickly reversible Less than the project life Short-term	Reversible over time Life of the project Medium-term	Permanent Beyond closure Long-term

The consequence of impacts is a function of the intensity, extent and duration. The significance of impacts = probability x consequence

4 CONSTRAINTS AND LIMITATIONS OF STUDY

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

5 BASELINE ASSESSMENT OF THE SOILS AND AGRICULTURAL CAPABILITY

This section is organised in sub headings based on the requirements of an agricultural study as detailed in section 2 of this report. A satellite image map of the project layout is shown in Figure 2 and site photographs are shown in Figures 3 to 6.

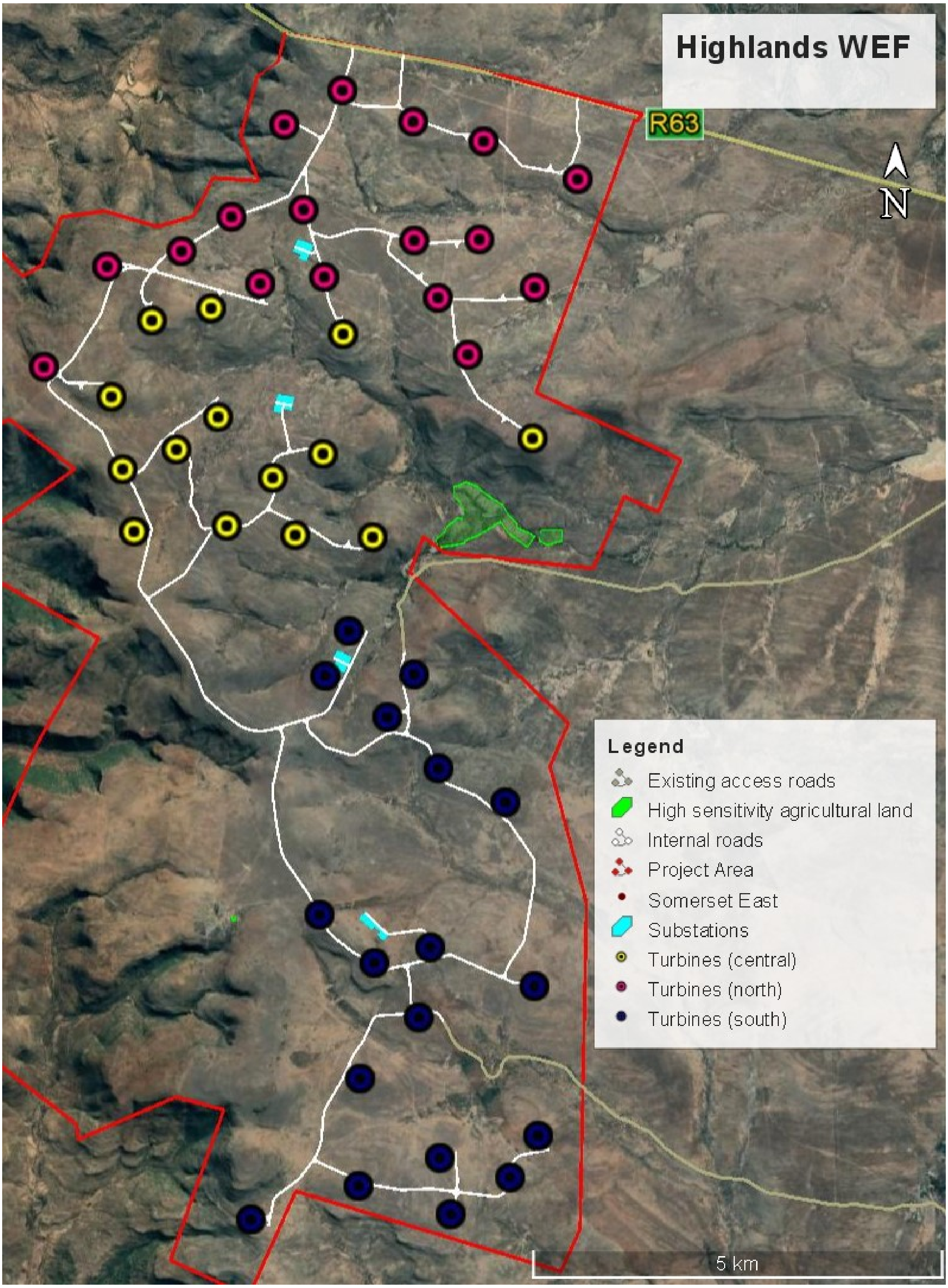

Figure 2. Satellite image map of the project layout.

Figure 3. Photograph of typical site conditions.

Figure 4. Photograph of typical site conditions.

Figure 5. Photograph of typical shallow, clay-rich soils on site.

Figure 6. Photograph of erosion occurring and showing the susceptibility of the soils to erosion once they have been disturbed.

5.1 Climate and water availability

Rainfall for the study area is given as 436 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). The average monthly distribution of rainfall is shown in Figure 7. Rainfall and resultant moisture availability is insufficient to support viable, rainfed cultivation of crops.

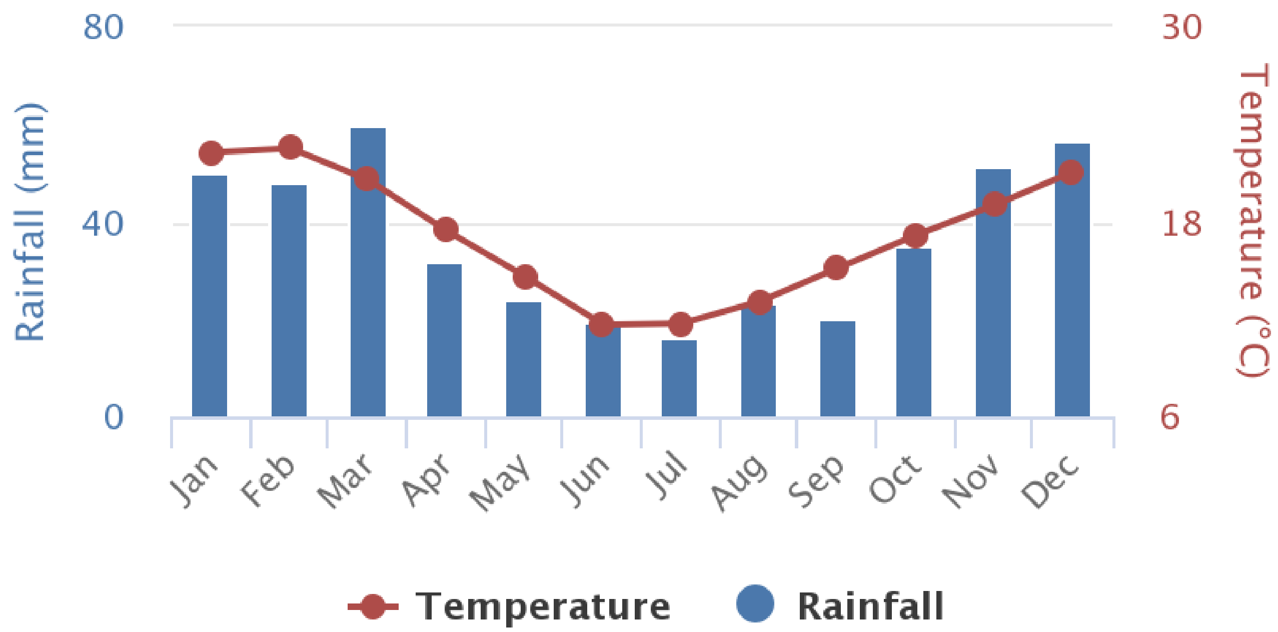

Figure 7. *Average monthly temperature and rainfall for location (-32.76, 25.35), which is in the centre of the project area, from 1991 to 2015 (The World Bank Climate Change Knowledge Portal, 2015).*

There are some small farm dams across the project area, with some very small patches of irrigated cultivation. Sufficient irrigation water is not available for any significant area of irrigated land.

5.2 Terrain, topography and drainage

The project is located across hilly terrain on the edge of a plateau that drops off steeply to the west. The highest part of the plateau is along the crest of the hills, near the western edge, that reaches an altitude of just over 1,100 metres. The project area drops gradually eastwards onto the plateau to an altitude of around 900 metres. There is a wide range of slopes across the hilly terrain. There are a number of eastward flowing, non-perennial water courses across the project area.

The underlying geology of the project area is mudstone and sandstone of the Beaufort Group of the Karoo Supergroup.

5.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The wind farm infrastructure is proposed almost entirely on a single land type, Fc168, although a very small part if it extends into a second land type, Db169. Soils of both land types are very similar. They are predominantly very shallow, clay-rich, reasonably drained soils on underlying rock. Dominant soil forms are Glenrosa and Swartland. A smaller proportion of deeper Oakleaf soils also occur. A summary detailing soil data for the land types is provided in Appendix 1. The field investigation confirmed that the dominant soil types are shallow soils on underlying rock. The shallow, clay-rich soils are susceptible to erosion.

5.4 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops. Detail of this land capability scale is shown in Table 2.

The proposed project area is classified with predominant land capability evaluation values of 5-6. The land capability of the more rugged, hilly terrain, drops all the way down to a value of 1 in places. The land capability of the project area is therefore classified as being unsuitable for the production of cultivated crops. The land capability is predominantly limited by the low climatic moisture availability and the shallow soils.

The farmer reports a stocking rate of 1 large stock unit per 10 hectares.

Table 2. Details of the 2017 Land Capability classification for South Africa.

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

5.5 Land use and development on and surrounding the site

The project is located in a sheep farming area. The only agricultural infrastructure within the proposed footprint area are small farm dams, wind pumps, stock watering points and fencing surrounding grazing camps. The three farmsteads within the project area fall outside of the proposed footprint area.

Access to the developments is by way of farm access roads that will require upgrading.

5.6 Status of the land

The project area is almost entirely grazed, natural veld. There are some areas of minor erosion but there not areas of very significant erosion or other significant land degradation across the study area.

5.7 Possible land use options for the site

Due to both the climate and soil limitations, the land is not suited to cultivation and grazing is the only viable agricultural land use.

5.8 Agricultural sensitivity

Agricultural sensitivity is directly related to the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity in the country of land that is only suitable as grazing land and such land is therefore not considered to have high agricultural sensitivity.

Agricultural sensitivity of the project area was assessed in terms of the following 4 categories:

1. Very High (No-Go, no development should take place; this includes roads and other associated infrastructure)
2. High (No turbines, other infrastructure permitted)
3. Medium (Turbines and infrastructure permitted with mitigations)
4. Low (Preferred area for turbines and infrastructure)

Google Earth imagery was used to identify the few small patches within the site that have historically been cultivated. Such areas were identified as very high sensitivity because it makes sense that the development should avoid them. Such areas are shown in Figure 8. Although they are likely to be marginal for cultivation, they are nevertheless areas that have arable production potential. Wind farm infrastructure can be developed, without significant agricultural impact, on any other part of the site and therefore all other areas are categorised as low sensitivity.

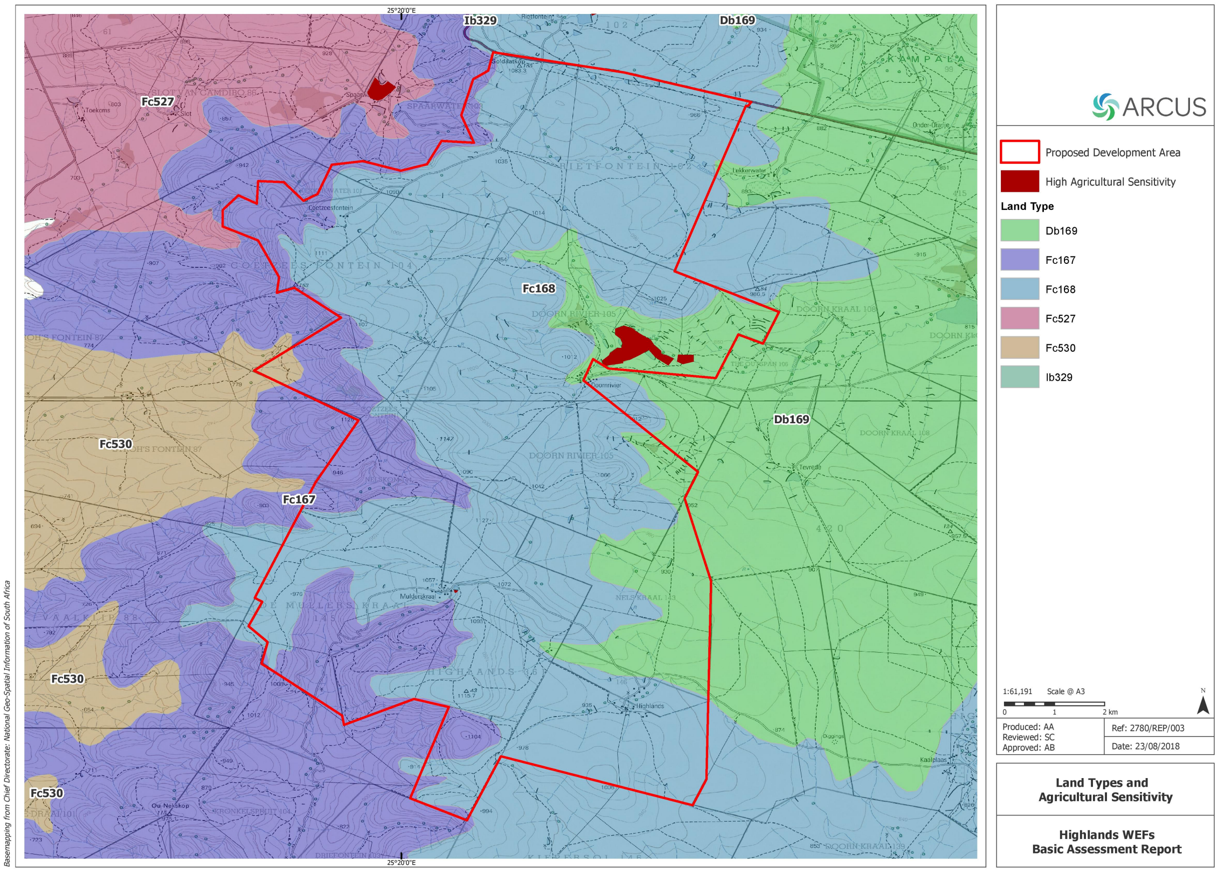

Figure 8. *Map showing land types and areas of very high agricultural sensitivity across the study area.*

6 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. Although the development may include impacts on the resident farming community, for example visual impacts, such lifestyle impacts do not necessarily impact agricultural production and are therefore not relevant to and within the scope of an agricultural impact assessment. Such impacts are better addressed within the impact assessments of other disciplines.

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

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

6.1 Impacts of the wind farm components

The identification and assessment of impacts is identical for all three wind farm components, as all three involve the same infrastructure and activities in the same agricultural environment.

The significance of all potential agricultural impacts is kept low by two important factors.

1. The actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the land available for grazing on the affected farm portions. The wind farm infrastructure will only occupy approximately 2% of the surface area. All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the small development footprint for the duration of and after the project.
2. The proposed site is on land of limited agricultural potential that is only viable for grazing.

Three potential agricultural impacts have been identified. Two of these are direct, negative impacts and apply to all three phases of the development (construction, operational and decommissioning). The third impact is a positive, indirect impact and only applies to the operational phase. The impacts are assessed in table format below.

<table>
<tr><th colspan="8">Impact Phase: Construction, Operation & Decommissioning</th></tr>
<tr><td colspan="8">Potential impact description: Loss of agricultural land use.

Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.</td></tr>
<tr><th></th><th>Intensity</th><th>Extent</th><th>Duration</th><th>Status</th><th>Probability</th><th>Significance</th><th>Confidence</th></tr>
<tr><td>Without Mitigation</td><td>Low</td><td>Low</td><td>Medium</td><td>Negative</td><td>Low</td><td>Low</td><td>High</td></tr>
<tr><td>With Mitigation</td><td>Low</td><td>Low</td><td>Medium</td><td>Negative</td><td>Low</td><td>Low</td><td>High</td></tr>
<tr><td colspan="3">Can the impact be reversed?</td><td colspan="5">Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.</td></tr>
<tr><td colspan="3">Will impact cause irreplaceable loss of resources?</td><td colspan="5">No, because only a very small amount of grazing land is lost and such land is not a scarce resource.</td></tr>
<tr><td colspan="3">Can impact be avoided, managed or mitigated?</td><td colspan="5">Yes, to some extent, see below.</td></tr>
<tr><td colspan="8">Mitigation measures to reduce residual risk or enhance opportunities:

- The only possible mitigation measure is the avoidance of high sensitivity areas by the design layout, and this has already been implemented during the design phase.</td></tr>
</table>

The intensity is considered low because of the very small amount of land and because of its low agricultural potential only as grazing land. The extent is low because the impact is limited to within the project area and only to parts of it (the direct footprint). The duration is medium because the impact lasts for the life of the project.

Impact Phase: Construction, Operation & Decommissioning							
Potential impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Medium	Low	Medium	Negative	Medium	Medium	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Soil degradation can be reversed only to some extent and only with substantial inputs over a significant period of time.				
Will impact cause irreplaceable loss of resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			Yes, see below.				

Mitigation measures to reduce residual risk or enhance opportunities:

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

The intensity is considered medium without mitigation because unchecked erosion would cause a partial loss of land capability. With effective mitigation, degradation can be prevented and the intensity is therefore considered low. The extent is low because the impact is limited to within the project area and only to parts of it. The duration is medium because the impact lasts for the life of the project.

Impact Phase: Operation							
Potential impact description: Generation of additional land use income Income will be generated by the farming enterprises through the lease of the land to the energy facility. This will provide the farming enterprises with increased cash flow and rural livelihood, and thereby improve their financial sustainability.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Low	Low	Medium	Positive	High	Medium	High
With Mitigation	Low	Low	Medium	Positive	High	Medium	High
Can the impact be reversed?			Yes, it is reversed as soon as income generation ceases at the end of the project.				
Will impact cause irreplaceable loss of resources?			Not at all.				
Can impact be avoided, managed or mitigated?			No				

The intensity is considered low because the increased income is only likely to affect a minor improvement to farming on the land. The extent is low because the impact is limited to within the project area. The duration is medium because the impact lasts for the life of the project.

6.2 Cumulative impacts of the wind farm components

The cumulative impact of a development is the impact that development will have when its impact is considered together with the impacts of other proposed developments that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the sum of proposed developments that impact an environment will cause an acceptable level of change to be exceeded.

For formal assessment purposes, in terms of the NEMA regulations, cumulative impacts are assessed by taking all known, proposed, similar developments within a certain distance of the development being assessed, into account. Restricting the cumulative impacts to similar developments is entirely arbitrary (but perhaps administratively necessary), because all developments, regardless of their type and similarity, will contribute to exceeding an acceptable level of change.

The formal assessment of the cumulative impact of the Highlands WEF has been assessed by consideration of all renewable energy developments within 35 km of this development. This includes only two other developments, the Middleton Wind Energy Project and the Pearson Solar PV project. These developments have very similar impacts within a similar agricultural environment, within the same Renewable Energy Development Zone (REDZ), although the solar development occupies a greater footprint of grazing land than the wind facilities.

The potential cumulative impact of importance is a regional loss of agricultural land use. What is important in assessing this impact is that the cumulative impact is affecting an agricultural environment that has been declared a REDZ precisely because it is an environment that can accommodate numerous renewable energy developments without exceeding acceptable levels of agricultural land use loss. This is primarily because of the low agricultural capability of land across the REDZ, and the fact that such land is not a scarce resource in South Africa. It is far more preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development, elsewhere in the country.

Another important factor which renders the cumulative impact very low, is the fact that the footprint of disturbance of wind farms is very small in relation to available land (approximately 2% of surface area). Therefore even if every single farm portion across the entire REDZ contained wind farms, the total cumulative footprint would never exceed 2% of the land surface, which would still be below acceptable levels of change. In reality the cumulative impact across the landscape is much lower because only a small percentage of farms are ever likely to contain wind farms.

The cumulative impact is assessed in table format below.

<table>
<tr><th colspan="8">Impact Phase: Construction, Operation & Decommissioning</th></tr>
<tr><td colspan="8">Potential impact description: Regional loss of agricultural land use.
Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.</td></tr>
<tr><th></th><th>Intensity</th><th>Extent</th><th>Duration</th><th>Status</th><th>Probability</th><th>Significance</th><th>Confidence</th></tr>
<tr><td>Without Mitigation</td><td>Low</td><td>Low</td><td>Medium</td><td>Negative</td><td>Low</td><td>Low</td><td>High</td></tr>
<tr><td>With Mitigation</td><td>Low</td><td>Low</td><td>Medium</td><td>Negative</td><td>Low</td><td>Low</td><td>High</td></tr>
<tr><td colspan="3">Can the impact be reversed?</td><td colspan="5">Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.</td></tr>
<tr><td colspan="3">Will impact cause irreplaceable loss of resources?</td><td colspan="5">No, because only a very small amount of grazing land is lost and such land is not a scarce resource.</td></tr>
<tr><td colspan="3">Can impact be avoided, managed or mitigated?</td><td colspan="5">Yes, to some extent, see below.</td></tr>
<tr><td colspan="8">Mitigation measures to reduce residual risk or enhance opportunities:
- The only possible mitigation measure is the avoidance of high sensitivity areas by the design layout, and this has already been implemented during the design phase.</td></tr>
</table>

6.3 Impacts of the electrical grid connection components

The identification and assessment of impacts is identical for all three electrical grid connection components, as all three involve the same infrastructure and activities in the same agricultural environment. The assessment of impacts is also identical for the two alternatives in each of the three grid connections, as there is nothing materially different that would result in different impacts between any of the two alternatives.

The significance of all potential agricultural impacts is kept low by two important factors.

1. Electricity grid infrastructure has minimal impact on agriculture after construction because all viable agricultural activities in the project area can continue, undisturbed below power lines.
2. The proposed site is on land of limited agricultural potential that is only viable for grazing.

Only one agricultural impact has been identified. It is a direct, negative impact that applies to two of the phases of the development (construction and decommissioning). It is assessed in table format below.

Impact Phase: Construction & Decommissioning							
Potential impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance and vegetation removal. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Medium	Low	Medium	Negative	Medium	Medium	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Soil degradation can be reversed only to some extent and only with substantial inputs over a significant period of time.				
Will impact cause irreplaceable loss of resources?			No, because a very small amount of grazing land is impacted and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			Yes, see below.				
Mitigation measures to reduce residual risk or enhance opportunities: • Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened							

surfaces and it must prevent any potential down slope erosion.

- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Note: The assessment is identical for each of the two alternatives in each of the three components.

The intensity is considered medium without mitigation because unchecked erosion would cause a partial loss of land capability. With effective mitigation, degradation can be prevented and the intensity is therefore considered low. The extent is low because the impact is limited to within the project area and only to parts of it. The duration is low because the impact will only last for the short term after disturbance.

6.4 Cumulative impacts of the electrical grid connection components

The observations on cumulative impact, presented in Section 6.2, apply for the electrical grid connection components as well. In fact, because of the even lower (negligible) agricultural impacts of power lines compared to wind farms, the agricultural environment can accommodate far more electricity grid infrastructure than currently exists, or is currently proposed, before acceptable levels of change are exceeded. Acceptable levels of change in terms of other types of impact, for example visual impact, would be exceeded long before the levels for agricultural impact became an issue. For the above reasons, the cumulative agricultural impact of the electrical grid connection components can confidently be assessed as negligible and a more formal assessment is irrelevant.

7 CONCLUSIONS

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

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

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

Slight changes to the development layout (micro-siting) were done following all specialist assessments. These changes have no influence on the results of this assessment.

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

There are no conditions resulting from this assessment that need to be included in the Environmental Authorisation.

8 REFERENCES

Department of Agriculture, Forestry and Fisheries, 2017. National land capability evaluation raster data layer, 2017. Pretoria.

Department of Agriculture, Forestry and Fisheries, 2002. National land type inventories data set. Pretoria.

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 types are arranged in the table in descending order in terms of the proportion of the project area that each covers.

Land type	Land capability class	Soil series (forms)	Depth (mm)			Clay % A horizon			Clay % B horizon			Depth limiting layer	% of land type
Fc168	6	Glenrosa	100	-	250	6	-	25	15	-	35	so	38
		Swartland	100	-	300	6	-	15	35	-	45	R	29
		Oakleaf	500	-	1200	6	-	15	15	-	35	R	10
		Mispah	50	-	200	6	-	15				R	5
		Hutton	150	-	400	6	-	15	10	-	35	R,db	5
		Valsrivier	100	-	250	10	-	25	35	-	55	vr,vp	4
		Sterkspruit	50	-	200	6	-	15	35	-	55	R	4
		Rock outcrop											4
		Dundee	800	>	1200	6	-	10				U	2
Db169	5	Swartland	100	-	300	6	-	20	35	-	55	vr,vp	33
		Glenrosa	50	-	200	6	-	25	15	-	35	so	26
		Sterkspruit	100	-	250	6	-	15	35	-	55	pr	8
		Mispah	100	-	200	6	-	15				R	8
		Rock outcrop											7
		Hutton	150	-	400	6	-	15	15	-	35	R,db	7
		Valsrivier	100	-	300	10	-	25	35	-	55	vr,vp	6
		Oakleaf	500	-	1200	6	-	15	15	-	35	R	5
		Dundee	800	>	1200	0	-	6				R	1

Land capability classes:
1 = very high potential arable land
2 = high potential arable land
3 = moderate potential arable land
4 = marginal potential arable land
5 = non-arable, moderate potential grazing land;
6 = non-arable, low to moderate potential grazing land
7 = non-arable, low potential grazing land;
8 = non-utilisable wilderness land.

Depth limiting layers: R = hard rock; so = partially weathered bedrock; lo = partially weathered bedrock (softer); ca = soft carbonate; ka = hardpan carbonate; db = dorbank hardpan; hp = cemented hardpan plinthite (laterite); sp = soft plinthic horizon; pr = dense, prismatic clay layer; vp = dense, structured clay layer; vr = dense, red, structured clay layer; gc = dense clay horizon that is frequently saturated; pd = podzol horizon; U = alluvium.