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AGRICULTURAL IMPACT ASSESSMENT FOR KUDUSBERG WIND ENERGY FACILITY PROJECT BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE NORTHERN AND WESTERN CAPE PROVINCES: BASIC ASSESSMENT REPORT

Report by:
Johann Lanz
for
CSIR – Environmental Management Services
PO Box 320
Stellenbosch
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22 October 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

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:	22 October 2018

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EXECUTIVE SUMMARY

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. This assessment has found that the proposed development will only impact agricultural land which is of extremely low agricultural potential and which is only suitable for low intensity grazing.

The key findings of this study are:

- The proposed project area is dominated by rock outcrop and very shallow soils on underlying rock. Dominant soil forms are Glenrosa and Mispah.
- The major limitations to agriculture are the limited climatic moisture availability, the rugged terrain and the shallow, rocky soils.
- As a result of these limitations, the agricultural use of the study area is limited to low intensity grazing only.
- The proposed infrastructural footprint of the wind farm is classified with land capability evaluation values of 1 – 4, which is very low to low.
- The significance of all agricultural impacts is kept low by three important factors:
    - The actual footprint of disturbance of the wind farm constitutes only a very small proportion of the available land;
    - The land has extremely limited agricultural potential; and
    - The footprint is concentrated on those parts of the landscape that are least suited to any agricultural use.
- Two potential negative impacts of the development on agricultural resources and productivity were identified as:
    - Soil erosion
    - Cumulative, regional loss of agricultural land.
- 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.
- All impacts (positive and negative) were assessed as having **low or very low significance after mitigation.**
- The recommended mitigation measure is for implementation of an effective system of storm water run-off control.
- Due to the low agricultural potential of the site, and the consequent very low, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.

1 INTRODUCTION

1.1 Scope and objectives

This report presents the Soil and Agricultural Impact Assessment undertaken by Johann Lanz (an independent consultant), appointment by the CSIR, as part of the Basic Assessment (BA) Process for the proposed construction and operation of the Kudusberg Wind Energy Facility (see Figure 1).

The objectives of the 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, monitoring requirements, and rehabilitation guidelines for all identified potential impacts.

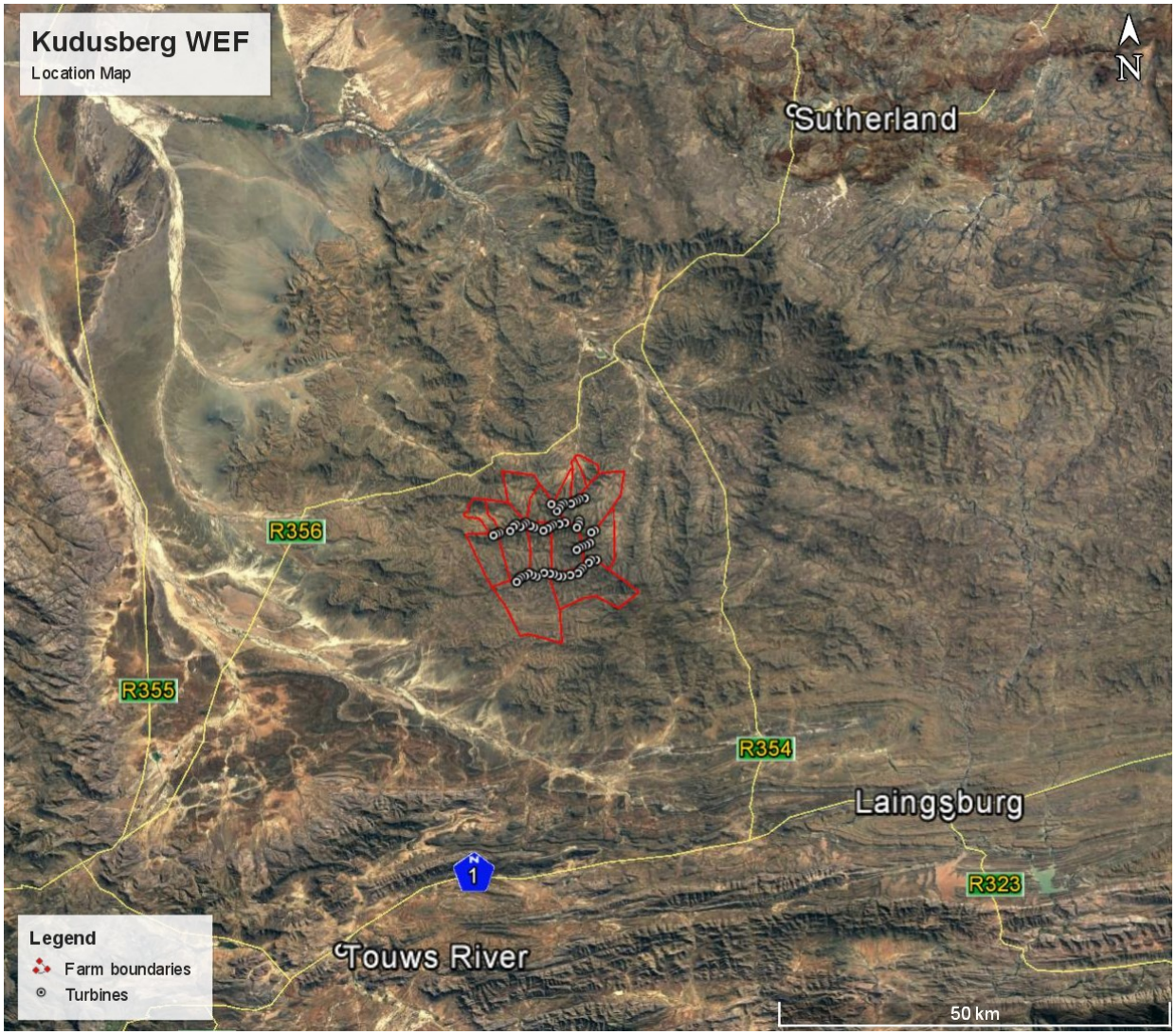

Figure 1: Location of Kudusberg WEF, north west of Laingsburg including properties to the north of the red farm boundaries relevant for access to the site

1.2 Terms of Reference

The following terms of reference apply to this study:

- A key task for the specialists is to review the existing sensitivity mapping from the SEA for the project area and provide an updated sensitivity map for the Kudusberg WEF project site.
- Adhere to the requirements of specialist studies in terms of Appendix 6 of the NEMA EIA Regulations (2014), as amended.
- Assess the potential impacts of the proposed Kudusberg WEF project and its associated infrastructure by assessing the impacts during the construction, operational and decommissioning phases.
- Assess Cumulative impacts from other Wind and Solar PV projects located within a 50 km radius from the Kudusberg WEF that already have received Environmental Authorisation (EA), are preferred bidders and/or may still be identified as having received a positive Environmental Authorisation at the start of this BA process.
- Use the Impact Assessment Methodology as provided by the CSIR.
- Propose mitigation measures to address possible negative effects and to enhance positive impacts to increase the benefits derived from the project.
- Assess the project alternatives and the no-go alternative.
- Provide a recommendation as to whether the project must receive Environmental Authorisation of not and Identify any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation.

Specific ToR:

- Describe the existing environment in terms of soils, geology, land-use and agricultural potential. Significant soils and agricultural features or disturbances should be identified, as well as sensitive features and receptors within the project area. The description must include surrounding agricultural land uses and activities, to convey the local agricultural context.
- Describe and map soil types (soil forms), soil characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers), and degradation and erodibility of soils etc to the extent necessary to inform this assessment.
- Varying sensitivities of the soils and agricultural potential must be mapped and highlighted.
- The assessment is to be based on existing information, findings of the Wind & Solar PV SEA

(CSIR, 2015), and professional experience and field work conducted by the specialist, as considered necessary and in accordance with relevant legislated requirements.

- Identify and assess the potential impacts of the proposed development on soils and agriculture, including impacts of associated infrastructure, such as the buildings, fencing etc.
- Identify any protocols, legal and permit requirements relating to soil and agricultural potential impacts that are relevant to this project and the implications thereof.
- The report needs to 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 (which may therefore be less than the standardised level of detail stipulated in the above regulations).

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
1. (1) A specialist report prepared in terms of these Regulations must contain-	
a) details of-	
i. the specialist who prepared the report; and	Title page
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	CV following Title page
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Following CV
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(ca) an indication of the quality and age of base data used for the specialist report;	Section 2.1
(cb) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5.4
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
f) 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 4.7 & Figure 3
g) an identification of any areas to be avoided, including buffers;	Section 4.7
h) 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; no agricultural environmental sensitivities identified
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 5
k) any mitigation measures for inclusion in the EMPr;	Section 8
l) any conditions for inclusion in the environmental authorisation;	Section 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion-	
i. whether the proposed activity, activities or portions thereof should be authorised;	Section 9
(iA) regarding the acceptability of the proposed activity or activities and	Section 8
ii. 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 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Will be done following the release of the DBAR for comment should it be

	relevant.
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Any relevant comments received on the DBAR will be incorporated in the finalised report
q) any other information requested by the competent authority. n/a	n/A
2) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable

2 APPROACH AND METHODOLOGY

The area in which the development is proposed is of extremely low land capability and severely limited by climatic moisture availability. A field investigation was not therefore considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data for the site, as well as satellite imagery of the site available on Google Earth. This level of assessment is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development.

The potential impacts identified in this specialist study were assessed based on the criteria and methodology common to the whole impact assessment. The ratings of impacts were based on the specialist's knowledge and experience of the field conditions of the environment in which the proposed development is located, and of the impact of disturbances on that agricultural environment.

2.1 Sources of information

The following sources of information were used:

1. 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. 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.
2. Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
3. Rainfall and temperature data were sourced from The World Bank Climate Change Knowledge Portal, dated 2015.
4. Satellite imagery of the site and surrounds was sourced from Google Earth.

5. The Strategic Environmental Assessment for wind and solar photovoltaic development in South Africa (DEA, 2015) was also consulted in terms of its sensitivity analysis of the area.

2.2 Assumptions and Limitations

The following assumptions were used in this specialist study:

- The study assumes 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.
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Appendix B.

The following limitation was identified in this 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 limitations or knowledge gaps relevant to this study.

3 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO AGRICULTURAL IMPACTS

The Kudusberg WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 56 wind turbines with a foundation of up to 30 m in diameter and up to 5 m in depth.
- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 90mx50m (total footprint 25.2 ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2 m x 2 m but can be up to 10 m x 10 m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible,

with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.

- Internal access roads up to 12 m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44 ha. Where possible, existing roads will be upgraded. Turns will have a radius of up to 50 m in order for abnormal loads (especially turbine blades) to access the various turbine positions.
- One 33/132kV onsite substation with a total footprint of approximately 2.25 ha.
- Up to 4 x 140 m tall (depending on the final hub height) wind measuring lattice masts
- Temporary infrastructure including a construction camp (~12.6 ha) which includes an onsite concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp and batching plant. The entire facility would not be fenced off.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the DWS will be applied for separately.

For agricultural impacts, the exact nature of the different infrastructure within the facility has very little bearing on the significance of impacts. What is of most relevance is simply the occupation of the land, and whether it is being occupied by a turbine foundation, a hardstand, a building or a substation makes no difference. What is of most relevance therefore is simply the total footprint of the facility.

4 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 3.

4.1 Climate and water availability

The site has an extremely low average rainfall of 125 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). The average monthly rainfall distribution is shown in Figure 2. The low rainfall is a very significant agricultural constraint that seriously limits the level of agricultural production (including grazing) which is possible. There are no dams across the project area.

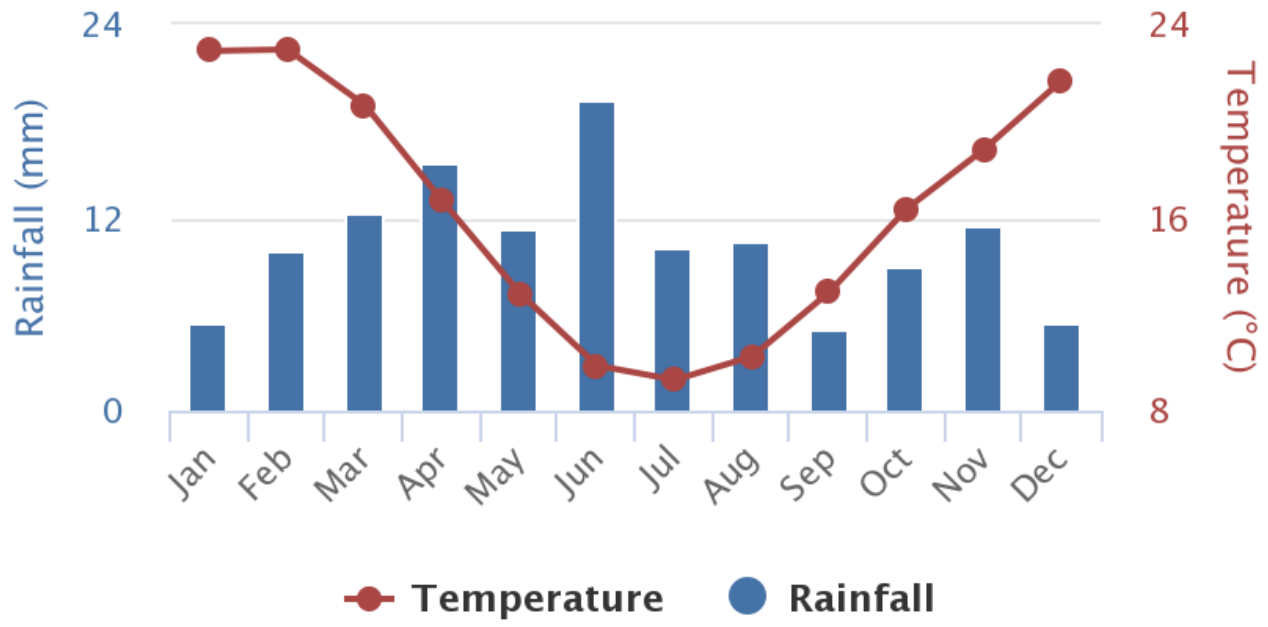

Figure 2: Average monthly temperature and rainfall for location (-32.88, 20.33), which is in the centre of the project area, from 1991 to 2015 (The World Bank Climate Change Knowledge Portal, 2015).

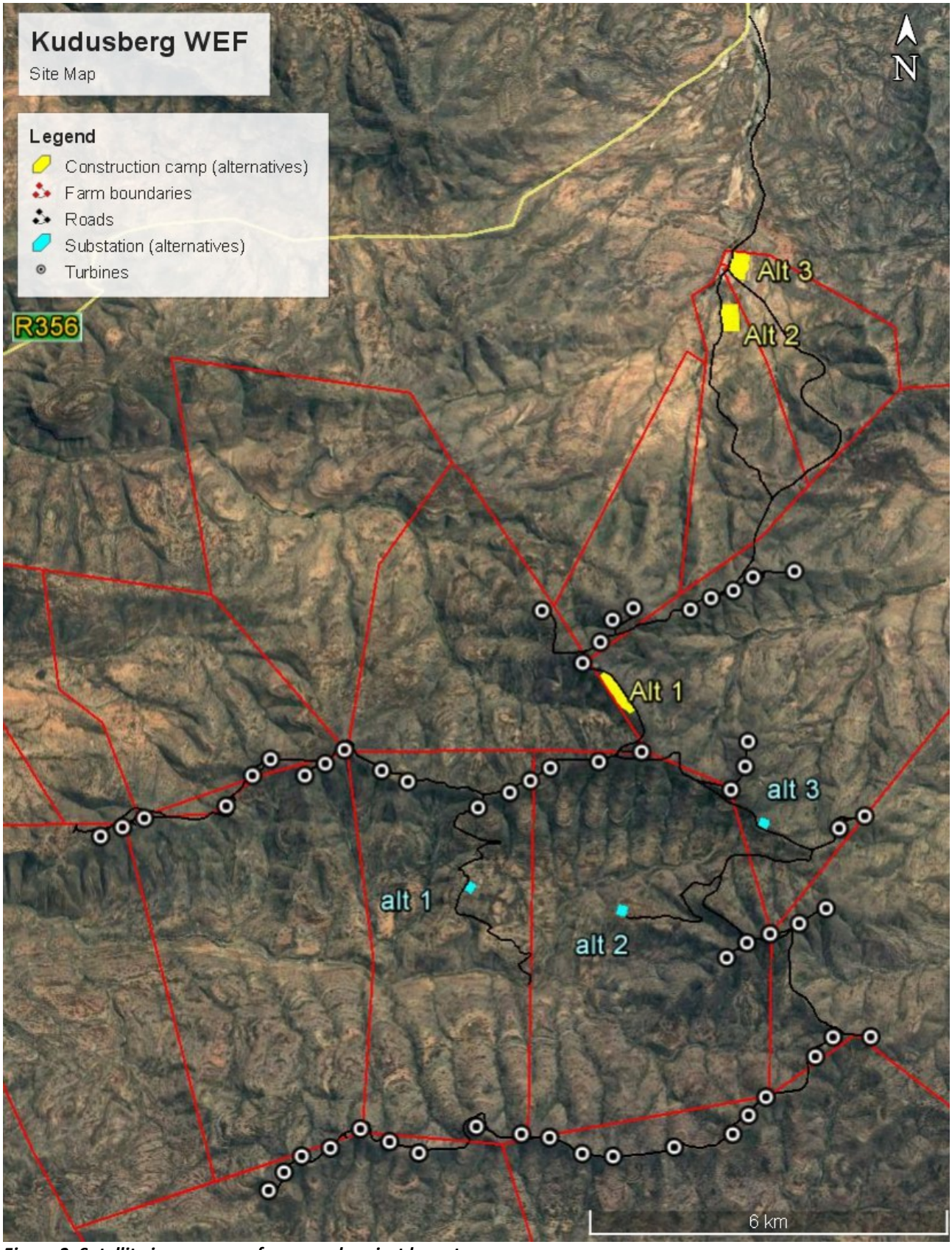

Figure 3: Satellite image map of proposed project layout.

4.2 Terrain, topography and drainage

The project is located across very hilly terrain. Turbines are located along the crests of several east west orientated ridges with valleys between them. The ridges attain a maximum altitude of approximately 1,350 metres and the valleys drop down to approximately 850 metres. There is a wide range of slopes across the hilly terrain. There are several non-perennial water courses, typical of arid areas, in the valleys.

The underlying geology of the project area is mudstone, siltstone and sandstone of the Beaufort Group and also sandstone, siltstone and shale of the Ecca Group of the Karoo Supergroup.

4.3 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 entirely on a single land type, Fc269. This land type is dominated by rock outcrop (37% of surface area) and extremely shallow soils on underlying rock. Dominant soil forms are Glenrosa and Mispah. A summary detailing soil data for the land types is provided in Appendix 1.

4.4 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 infrastructural footprint of the wind farm is classified with land capability evaluation **values of 1 – 4**, which is some of the lowest land capability in the country. The land capability is limited by the very low climatic moisture availability, the rugged terrain, and the shallow, rocky soils.

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	

4.5 Land use and development on and surrounding the site

The project is located in a sheep farming area and there is no other agricultural activity or infrastructure within the project area.

4.6 Possible land use options for the site

Due to the climate, terrain and soil limitations, the land is considered unsuitable for any agricultural purposes other than low intensity grazing.

4.7 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. Arable land is a scarce resource in South Africa and is therefore preservation worthy, and as a result has a high sensitivity. Land that is only suitable as grazing land, however, is not a particularly scarce resource and therefore has a low sensitivity. In terms of the sensitivity categories used in the REDZ sensitivity analysis, this site was assessed as low sensitivity (DEA, 2015).

Agricultural conditions and potential are uniform across the proposed footprint and the choice of placement of infrastructure therefore has no influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the investigated site and no parts of it therefore need to be avoided by the development. There are no required buffers.

5 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 ways in which the project can impact on soils, agricultural resources and productivity are:

- Disturbance and changes to the land surface characteristics (particularly the establishment of roads), which may lead to erosion.

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

1. The actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the surface area of the affected farms. The wind farm infrastructure will only occupy approximately 2% of the surface area, based on typical figures for wind farms in South Africa (CSIR, 2015). Therefore, the impact of erosion will not be widespread and can at worse only affect a very limited proportion of the surface area. All grazing will be able to continue unaffectedly across the farms.
2. The proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing.

3. The proposed infrastructural footprint is concentrated on the crests of ridges, which are the rockiest parts of the landscape and the least suitable for any agricultural use.

The following impacts are identified for the different phases of the development and described in table format below.

The revised layout, dated 15 October 2018, involves slight changes to the micro-siting of infrastructure from the originally assessed layout. The revised layout has been assessed and does not affect the impact assessment in any way.

5.1 Construction phase

5.1.1 Minimal soil and land degradation (erosion and topsoil loss) as a result of land disturbance.

Aspect / Activity	Soil disturbance and changes to the land surface and run-off characteristics, particularly due the establishment of roads and hardstands.
Type of impact	Direct
Potential Impact	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high.
Status	Negative
Mitigation Required	Implement and maintain an effective system of storm water run-off control in all places where run-off accumulation poses an erosion risk. 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.
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Very low

5.2 Operational phase

5.2.1 Minimal soil and land degradation (erosion and topsoil loss) as a result of land disturbance.

Aspect / Activity	Soil disturbance and changes to the land surface and run-off characteristics, particularly due the establishment of roads and hardstands.
Type of impact	Direct
Potential Impact	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high.
Status	Negative
Mitigation Required	Implement and maintain an effective system of storm water run-off control in all places where run-off accumulation poses an erosion risk. 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.
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Very low

5.2.2 Additional land use income

Aspect / Activity	Payment of rental to farmers by the energy facility
Type of impact	Indirect
Potential Impact	Additional land use 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.
Status	Positive
Mitigation Required	None
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Not applicable because there is no possible mitigation

5.3 Decommissioning phase

5.3.1 Minimal soil and land degradation (erosion and topsoil loss) as a result of land disturbance.

Aspect / Activity	Soil disturbance and changes to the land surface and run-off characteristics, particularly due the establishment of roads and hardstands.
Type of impact	Direct
Potential Impact	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high.
Status	Negative
Mitigation Required	Implement and maintain an effective system of storm water run-off control in all places where run-off accumulation poses an erosion risk. 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.
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Very low

5.4 Cumulative impacts

The cumulative impact of a development is the impact that development will have when its impact is considered together with the incremental impacts of other past, present or reasonably foreseeable future activities 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 Kudusberg WEF has been assessed by consideration of other wind and solar PV projects located within a 50 km radius from the Kudusberg WEF that had already received Environmental Authorisation (EA) or were preferred bidders at the start of this BA process on 03 July 2018.

Twenty two wind farms and 1 solar farm have been identified within a radius of 50 km from the proposed Kudusberg WEF project site. Details on these projects are provided in Appendix 2. All of these developments have very similar impacts within a very similar agricultural environment, within the same Renewable Energy Development Zone (REDZ).

The potential cumulative impact is a regional loss of agricultural land. 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 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.

This environment could accommodate many more renewable energy projects than currently exist or than the 23 proposed ones that are considered for this assessment, before acceptable levels of change have any likelihood of being exceeded. Acceptable levels of change in terms of other areas of impact such as visual impact would be exceeded long before agricultural levels of change came anywhere near to being exceeded.

The cumulative impact is described in table format below.

Aspect / Activity	Occupation of and impact to the land by the project infrastructure of multiple developments
Type of impact	Direct
Potential Impact	Cumulative impacts are likely to occur as a result of the regional impact on agricultural land because of other developments on agricultural land in the region. Because the land is of such low agricultural potential, the cumulative loss of agricultural resources is of very low significance.
Status	Negative
Mitigation Required	There is no additional mitigation required for cumulative impacts, other than what has already been recommended for the project above.
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

5.5 Assessment of alternatives

Because of the low agricultural impacts and the agricultural uniformity of the site, there is no material difference between the significance of impacts of any of the proposed alternatives. Therefore, from an agricultural impact perspective, there are no preferred alternatives, and therefore all the alternatives proposed below are acceptable from an agricultural perspective.

The proposed alternatives are:

Two access road alternatives would connect the public MN004469 road to the new wind farm road network between the turbines on the ridges:

- Access road alternative 1, western route is approximately 4.6 km in length, almost all of which comprises an existing jeep track
- Access road alternative 2, the eastern route is approximately 5.7 km in length, almost all of which would be a new road

Three alternative construction camp layouts (as shown in Figure 3), including the area required for a batching plant, will
be assessed:

- Construction camp 1 is located on a flat high-lying area between turbines 43 and 47;
- Construction camp 2 is located adjacent to and east of the MN4469 public road on the

remainder of the farm 193 Urias Gat, south of construction camp 3; and
- Construction camp 3 is located adjacent to and east of the MN4469 public road on portion 6 of the farm 193 Urias Gat, north of construction camp 2.

Three onsite 33/132kV substation location alternatives were identified (as shown in Figure 3) based on technical studies which considered aspects such as topography, earth works and levelling, environmentally sensitive features, electrical losses, turbine locations and existing agricultural use. All three positions are located relatively in the centre of the facility.

- Substation alternative 1 is located south of turbine 38 and north of turbine 9;
- Substation alternative 2 is located south of turbine 42 and north of turbine 13; and
- Substation alternative 3 is located southeast of turbine 44.

5.6 Assessment of the no-go alternative

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The one identified potential such impact is that due to continued low rainfall in the area, in addition to other economic and market pressures on farming, the agricultural enterprises will come under increased pressure in terms of economic viability.

Because of the very low negative impacts of the development and its one positive economic impact (also low), the development is assessed, from an agricultural impact perspective, as the preferred alternative over the no-go alternative.

6 IMPACT ASSESSMENT TABLES

The fact that the footprint of disturbance affects such a small proportion of the surface area influences the assessment of probability of an impact. If an impact such as erosion is likely to occur in only a few isolated spots within the larger project area, then its probability of occurring is assessed in the tables as lower, because the probability of it impacting a significant area is low.

Table 3: Impact assessment summary table

Impact pathway	Nature of potential impact/risk	Mitigation	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Ranking of impact/ risk	Confidence level
SOIL AND AGRICULTURE															
CONSTRUCTION PHASE															
Direct impacts															
Land disturbance and establishment of hardened surfaces	Soil erosion	Without mitigation	Negative	Site	Medium term	Moderate	Very unlikely	Moderate	Low	Low	No	Yes	Implement an effective system of storm water run-off control.	5	High
		With mitigation	Negative	Site	Medium term	Slight	Extremely unlikely	Moderate	Low	Very low					
OPERATIONAL PHASE															
Direct impacts															
Existence of hardened surfaces	Soil erosion	Without mitigation	Negative	Site	Medium term	Moderate	Very unlikely	Moderate	Low	Low	No	Yes	Maintain an effective system of storm water run-off control.	5	High
		With mitigation	Negative	Site	Medium term	Slight	Extremely unlikely	Moderate	Low	Very low					
Indirect impacts															
Project land rental	Improvement of financial sustainability	Without mitigation	Positive	Site	Long term	Moderate	Very likely	High	Low	Low	No	No	N/A	4	High
		With												4	

Impact pathway	Nature of potential impact/risk	Mitigation	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Ranking of impact/ risk	Confidence level
	through additional land use income	mitigation													
DECOMMISSIONING PHASE															
Direct impacts															
Land disturbance and existence of hardened surfaces	Soil erosion	Without mitigation	Negative	Site	Medium term	Moderate	Very unlikely	Moderate	Low	Low	No	Yes	Maintain an effective system of storm water run-off control.	5	High
		With mitigation	Negative	Site	Medium term	Slight	Extremely unlikely	Moderate	Low	Very low					

Table 4: Impact assessment summary table - Cumulative impacts

Impact pathway	Nature of potential impact/risk	Mitigation	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Ranking of impact/ risk	Confidence level
SOIL AND AGRICULTURE															
CUMULATIVE IMPACTS															
Direct impacts															
Occupation of and disturbance to agricultural land	Loss of agricultural land	Without mitigation	Negative	Regional	Long term	Slight	Very unlikely	Moderate	Low	Very low	No	No		5	High

7 LEGISLATIVE AND PERMIT REQUIREMENTS

The Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA), requires that an application for the development be approved by the Department of Agriculture, Forestry and Fisheries (DAFF). DAFF reviews and approves this application according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). No application is required in terms of CARA. The EIA process covers the required aspects of this.

8 ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

The environmental management programme inputs for the protection of soil resources are presented in the tables below for each phase of the development.

Table 5: Management plan for the planning and design phase

Impact	Mitigation / management objectives and outcomes	Mitigation / management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Aspect: Protection of soil resources					
Erosion	That disturbance and existence of hard surfaces causes no erosion on or downstream of the site.	Design an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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.	Ensure that the storm water run-off control is included in the engineering design.	Once-off during the design phase.	Holder of the EA

Table 6: Management plan for the construction phase

Impact	Mitigation / management objectives and outcomes	Mitigation / management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Aspect: Protection of soil resources					
Erosion	That disturbance and existence of hard surfaces causes no erosion on or downstream of the site.	Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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.	Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Monthly	Environmental Control Officer (ECO)

Table 7: Management plan for the operational phase

Impact	Mitigation / management objectives and outcomes	Mitigation / management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Aspect: Protection of soil resources					
Erosion	That existence of hard surfaces causes no erosion on or downstream of the site.	Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.	Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream.	Bi-annually	Facility Environmental Manager

Impact	Mitigation / management objectives and outcomes	Mitigation / management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
			Corrective action must be implemented to the run-off control system in the event of any erosion occurring.		

Table 8: Management plan for the decommissioning phase

Impact	Mitigation / management objectives and outcomes	Mitigation / management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Aspect: Protection of soil resources					
Erosion	That disturbance and existence of hard surfaces causes no erosion on or downstream of the site.	Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.	Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Monthly	Environmental Control Officer (ECO)

9 CONCLUSIONS

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 extremely low agricultural

potential and only suitable for low intensity grazing.

All agricultural impacts of the proposed development are assessed as being of very low significance. This is because of the limited agricultural potential of the proposed development site, which is a function of the climate, terrain and shallow soils. The fact that the footprint of disturbance of the wind farm is limited to a very small proportion of the surface area also limits the agricultural impact. The study area has low agricultural sensitivity because of its low potential and no parts of the site need to be avoided by the proposed development. No buffers are required. There are no recommended alterations to the proposed layout. From an agricultural impact perspective there is no difference between any of the proposed alternatives and all of them are therefore preferred alternatives.

Due to the very low agricultural potential of the site, and the consequent very 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.

10 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.

DEA, 2015. Strategic Environmental Assessment for wind and solar photovoltaic development in South Africa. CSIR Report Number CSIR: CSIR/CAS/EMS/ER/2015/001/B. Stellenbosch.

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 9: Land type soil data for the site.

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Fc269	Rock outcrop					36.6
	Glenrosa	100 - 150	6 - 15	10 - 20	so	27.8
	Mispah	50 - 100	6 - 15		R	23.4
	Oakleaf	300 > 1200	5 - 10	10 - 30	R,U,ca	6.2
	Valsrivier	100 - 200	5 - 15	35 - 55	vr,vp	3.6
	Hutton	50 - 250	0 - 5	5 - 25	R,so	0.9
	Swartland	100 - 150	6 - 15	35 - 55	vr,R	0.9
	Clovelly	300 > 1200	0 - 5	0 - 5	R	0.7
	Dundee	300 - 1200	0 - 5		R,U,ca	0.1

Depth limiting layers: R = hard rock; so = partially weathered bedrock; ca = soft carbonate; vp = dense, structured clay layer; vr = dense, red, structured clay layer; U = alluvium.

APPENDIX 2: OTHER RENEWABLE ENERGY PROJECTS WITHIN A RADIUS OF 50 KM FROM THE PROPOSED KUDUSBERG WEF SITE

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
WIND PROJECTS							
14/12/16/3/3/2/967	Scoping and EIA	Biotherm Energy (Pty) Ltd	Proposed 140 MW Esizayo Wind Energy Facility and its associated infrastructure near Laingsberg within the Lainsburg Local Municipality in the Western Cape	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved
East -14/12/16/3/3/2/962 West- 14/12/16/3/3/2/693	Scoping and EIA	Biotherm Energy (Pty) Ltd	East: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the farm Welgemoed 268, the remainder of the farm Schalkwykskraal 204 and the remainder of the farm Drie Roode Heuvels 180 north of the town of Lainsburg within the Lainsburg and Karoo Hoodland Local Municipalities in the Western and Northern Cape Provinces	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			West: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the Farm Drie Roode Heuvels 180, the remainder of the farm Annex Drie Roode Heuvels 181, portion 1 of the farm Wolven Hoek 182 and portion 2 of the farm Wolven Hoek 182 north of the town of Lainsburg within the Karoo Hoodland Local Municipality in the Northern Cape Province.				
12/12/20/1966/AM5	Amendment	Witberg Wind Power (Pty) Ltd	Proposed establishment of the Witberg Wind Energy Facility, Laingsburg Local Municipality, Western Cape Province	Environmental Resource Management (Pty) Ltd / Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/1783/2/AM1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal West (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Environmental Resource Management (Pty) Ltd	Wind	110 MW	Under construction
12/12/20/1783/1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Savannah Environmental Consultants (Pty) Ltd	Wind	150 MW	Approved
14/12/16/3/3/2/899	Scoping and EIA	Rietkloof Wind Farm (Pty) Ltd	Proposed Rietkloof Wind Energy (36 MW) Facility within the Lainsbeug Local	EOH Coastal & Environmental Services	Wind	36 MW	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Municipality in the Western Cape Province				
TBC	BA		Proposed Rietkloof Wind Energy Facility, Western Cape, South AFrica	WSP	Wind	140 MW	In progress
14/12/16/3/3/2/826	Scoping and EIA	Gunstfontein Wind Farm (Pty) Ltd	Proposed 200 MW Gunstfontein Wind Energy Facility on the Remainder of Farm Gunstfontein 131 south of the town of Sutherland within the Karoo Hooglands Local Municipality in the Northern Cape Province, south of Sutherland.	Savannah Environmental Consultants (Pty) Ltd	Wind	200 W	Approved
12/12/20/1782/AM2	Scoping and EIA	Mainstream Power Sutherland	Proposed development of 140 MW Suther Wind Energy Facility, Sutherland, Northern and Western Cape Provinces	CSIR	Wind	140 MW	Approved
Karusa - 12/12/20/2370/1 Soetwater -12/12/20/2370/2	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Karusa & Soetwater)	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Preferred bidders. Construction to commence in 2019
12/12/20/2370/3	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Privinces (Greater Karoo))	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
West -14/12/16/3/3/2/856 East - 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farm (Pty) Ltd	Proposed 275 MW Komsberg West Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Proposed 275 MW Komsberg East Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces				
12/12/20/1988/1/AM1	Amendment	Roggeveld Wind Power (Pty) Ltd	Proposed Construction of the 140 MW Roggeveld Wind Farm within the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Western and Northern Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Preferred bidders. Construction to commence in 2019.
14/12/16/3/3/2/807/AM1	Scoping and EIA Amendment	Karreebosch Wind Farm (Pty) Ltd	Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its associated infrastructure within the Karoo Hoogland and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/2/900	Scoping and EIA	Brandvalley Wind Farm (Pty) Ltd	Proposed 147 MW Brandvalley Wind Energy Facility North of the Town of Matjiesfontein within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	EOH Coastal & Environmental Services	Wind	140 MW	Approved
TBA	Scoping and EIA	Rondekop Wind Farm (Pty) Ltd	Proposed establishment of the Rondekop WEF, south-west of Sutherland in the Northern Cape	SiVEST SA (Pty) Ltd	Wind	325 MW	In process
West 14/12/16/3/3/2/856 East 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farms (Pty) Ltd	Komsberg East and West WEF	Arcus Consulting Services (pty) Ltd	Wind	140 MW each	

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
TBC	BA	ENERTRAG SA (Pty) Ltd	Proposed Development of the Tooverberg Wind Energy Facility and the associated grid connection near Touws River, Wester Cape Province)	SiVEST SA (Pty) Ltd	Wind	140 MW	In process
SOLAR PROJECTS							
12/12/20/2235	BA	Inca Sutherland Solar (Pty) Ltd	Proposed Photovoltaic (Pv) Solar Energy Facility on A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	CSIR	Solar	10 MW	Approved