

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

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Chapter 6:

Land-use, Soil and Agricultural Potential Impact Assessment





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Chapter 6: Land-Use, Soil and Agricultural Potential Impact Assessment

GLOSSARY OF Terminology, Abbreviations and Acronyms:

GLOSSARY OF TERMS & DEFINITIONS	
AGIS	Agricultural Geo-Referenced Information System
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment



6 LAND-USE, SOIL AND AGRICULTURAL POTENTIAL IMPACT ASSESSMENT

This chapter presents the Land-use, Soil and Agricultural Potential Impact Assessment undertaken by Mr. Johann Lanz (an independent consultant), under appointment to the CSIR, as part of the Environmental Impact Assessment for the proposed Ishwati Emoyeni Wind Energy Facility, including the associated Eskom Transmission Infrastructure and Eskom Distribution Grid Connection Infrastructure near Murraysburg in the Western Cape.

6.1 INTRODUCTION

6.1.1 Terms of Reference

The terms of reference for the study fulfils the requirements for an agricultural study as described in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011, with an appropriate level of detail for the agricultural suitability and soil variation on site. In addition the terms of reference include the requirements of the Western Cape Provincial Department of Agriculture for such a study, as communicated by Mr Cor van der Walt.

The above requirements together with requirements for an EIA specialist report may be summarised as:

- Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed developments on agricultural resources including soils and agricultural production 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).
- Map soil survey points.
- Describe the topography of the site.
- Do basic climate analysis and identify suitable crops and their water requirements.
- Summarise available water sources for agriculture.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine the agricultural potential across the site.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

6.1.2 Assumptions

The following assumptions were used in this study:

- It was assumed that water is not available anywhere on the site for irrigation, except in the very limited cultivated area in the Ongers River valley, which crosses the eastern part of the site. Given the aridity constraints of the Karoo, this is a fair assumption.



- It is assumed that mitigation measures inherent to the project design, as described in the project description, will be implemented regardless of additional mitigation measures recommended by this study (i.e. ratings for impact 'without additional mitigation' is assumed to already include mitigation measures inherent to the design). Mitigation measures pertaining to this specific field of study that is assumed to be inherent to the project design include:
 1. A system of water run-off control to prevent erosion
 2. Minimisation of footprint of disturbance
 3. Confinement of vehicles to roads only
 4. Standard topsoil management involving stripping, stockpiling and re-spreading.

6.1.3 Limitations

The following limitations were identified in this study:

- Soils were not mapped in detail for the study. However detailed soil mapping has no relevance to an assessment of agricultural potential in this environment, as the limitations are overwhelmingly climatic. In other words, even where soils suitable for cultivation may occur, they cannot be utilised because of the aridity constraints. The study had more than sufficient information on the soils to make an assessment on the impacts of the development on agriculture.
- The assessment of impacts is based on theoretical predictions that cannot be 100 percent accurate. Predictions around some of the identified impacts have a high degree of uncertainty. These are indicated in the section on impact assessment. The other assessments for this study are based on sound information and have a high level of confidence. There are no other specific constraints and limitations for this study.

6.1.4 Information Sources

All data on land types, land capability, grazing capacity etc. was sourced from the online AGIS, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site available on Google Earth was also used for evaluation.

6.1.5 Specialist Expertise and Declaration of Independence

Refer to Appendix A of this Draft EIA Report for the Curriculum Vitae of Johann Lanz, which highlights his expertise. The declaration of independence by the specialist is provided in Box 6.1 below.



BOX 6.1: DECLARATION OF INDEPENDENCE

I, Johann Lanz, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Ishwati Emoyeni Wind Energy Facility, Eskom Transmission Infrastructure and Eskom Distribution Grid Connection Infrastructure Projects, applications or appeals in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JOHANN LANZ

6.2 APPROACH AND METHODOLOGY

6.2.1 Objectives of the Specialist Study

The objectives of the study are to identify and assess all potential impacts and economic consequences of the proposed developments on agricultural resources including soils and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

6.2.2 Approach and Methodology

The pre-fieldwork assessment was based on existing soil and agricultural potential data as well as satellite imagery for the site.

The Agricultural Geo-Referenced Information System (AGIS) data was supplemented by a field investigation. This was aimed at ground-truthing the AGIS data and achieving an understanding of soil types and veld conditions, and the variation of these across the site. It did not comprise a detailed soil mapping exercise, but was based on an overview assessment, which involved driving and walking across the site, assessing topography and surface conditions, investigating existing cuttings, and hand augering additional samples where necessary. The field assessment was done on 14 August 2012.

Soils are classified according to the South African soil classification system.

Detail on specific agricultural activity on the site and locally important soil and agricultural issues was obtained through interviews with farmers and agricultural role players in the area.



6.2.3 Scope of Work

The scope of work is captured and listed under terms of reference above.

6.3 PROJECT DESCRIPTION: AGRICULTURAL RESOURCES AND PRODUCTION

The components of the three projects that can impact on agricultural resources and productivity are:

1. Occupation of the sites by the footprint of the facility's infrastructure and roads.
2. Constructional activities that denude the surface cover of vegetation, for example for lay down areas, and / or disturb the soil below surface, for example for leveling, excavations, borrow pits etc.
3. Vehicle traffic on site

From an agricultural impact perspective, the positioning of all infrastructure does not have much influence, as agricultural potential is uniformly low across the site.

6.4 DESCRIPTION OF THE AFFECTED ENVIRONMENT: AGRICULTURAL RESOURCES AND PRODUCTION

6.4.1 Climate and water availability

Rainfall for the site is given as 262 mm per annum with a standard deviation of 78 mm according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in Table 6.1. In terms of the relationship between rainfall and evaporation the site is classified as arid, which is a serious limitation to agriculture. Cold temperatures are experienced in winter with frost and snowfalls occurring across the whole site.

There is limited ground water, obtained from wind pumps, available for stock use, but not sufficient quantity or quality for irrigation, except to a very limited degree along the Ongers River valley, which crosses the eastern part of the site (see Figure 6.1).

Table 6.1: Average monthly rainfall for the site (27° 59' S 26° 59' E) in mm
(Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
31	38	44	32	17	9	8	10	14	18	19	23	262

6.4.2 Terrain, soils and agricultural capability

The wind farm site is situated mostly across a high lying mountainous, rocky plateau in the central Karoo, 30 km north and north-west of the town of Murraysburg. There is a lower lying valley running through the eastern side of the site, in which some limited cultivation is done. The altitude of the site varies from 1200 meters in the valley to over 1600 meters at the highest point. The plateau which forms the main part of the Ishwati Emoyeni wind farm site is at an altitude of about 1400 meters. The two Eskom connection projects extend 20 km



westwards of the wind farm site across the flat Karoo plains at an altitude of approximately 1200 meters.

The geology of the site is shale, mudstone and sandstone of the Beaufort Group of the Karoo Sequence with abundant dolerite intrusions across most of it. The Acocks veld type is False Karoo. The biome is Nama Karoo and the vegetation type is Eastern mixed Nama Karoo.

There are five land type classifications across the sites. The land type classification is a nationwide survey that groups areas of similar soil and terrain conditions into different land types. The distribution of these different land types across the sites is illustrated in Figures 6.1 and 6.2. The high lying plateau is land type Fc131. These soils are predominantly shallow soils on rock (Mispah and Glenrosa soil forms) but there are also deeper Valsrivier, Hutton and Oakleaf soils in places. The slopes and edges of the plateau are land type Ib126 which is predominantly rock outcrops. The main valley in the east of the site is land type Ia94. This is predominantly deep Oakleaf soils that have developed in alluvium. There is some cultivation in this land type, but much of it is likely to be limited by high salinity. The lower lying plain on the west of the site is land type Da147. Dolerite intrusions are rare here. Soils are shallow on clay (Swartland soil form) as well as deeper soils of the Hutton and Oakleaf forms. A fifth land type, Fb488 occurs along a higher lying ridge in the west. Soils are very similar to the higher lying plateau area - shallow on rock. A summary detailing soil data for all land types is provided in Table A1 in Appendix 6.1 of this chapter. The field investigation of soil conditions provided ground-truthing of the accuracy of the land type soil data. Photographs of site conditions taken during the field investigation are given in Figure 6.3.

Land capability is the combination of soil suitability and climate factors. On the AGIS database the site has a land capability classification as: class 7, non-arable, low potential grazing land; as well as class 8, wilderness land on the steep plateau edges. Land capability is limited by climate, water availability, mountainous terrain and shallow, rocky as well as high salinity soil conditions. Grazing capacity is classified as 31-40 hectares per animal unit.

The agricultural potential largely equates to grazing capacity and is fairly uniform across the entire site. Although land types and veld types do vary in different landscape positions, the stock carrying capacity across them is uniform.

It therefore makes no difference from an agricultural potential point of view which parts of the site are utilised for the wind farm, and taken out of agricultural production as a result. Impacts will be of the same magnitude, irrespective of where turbines and other infrastructure are positioned. Impacts will be influenced more by the 'how' of the development than the 'where' of it. The only exception to this is that the area of potential cultivation in the river valley should be retained for agriculture, as such land is extremely limited in the area. This should be considered a no-go area for the development, and is indicated as such in Figure 6.1. The layout as indicated in Figures 6.1 and 6.2 completely avoids this no-go area.



Figure 6.1: Site plan of the proposed wind farm (boundary in red) showing positions of all turbines (yellow dots), roads (black) and the distribution of different land types across the site (light brown boundaries and labels, which correspond to Appendix 6.1). The only agriculturally sensitive (no-go) area of cultivation, in the Ongers River valley, is indicated with a green boundary.



Figure 6.2: Site plan of the proposed Eskom transmission and distribution projects showing the power line and on-site substation (in blue), and the distribution of different land types across the site (light brown boundaries and labels, which correspond to Appendix 6.1).

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Figure 6.3: Photographs showing veld and soil conditions on site. Top left: landscape on eastern side of plateau; top right: on western side of plateau; middle: shallow soils on underlying rock, left is where road material has been excavated; bottom: erosion gulleys showing typical deeper soil profiles.



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6.4.3 Land use and agricultural development at the site

Land use is grazing for sheep over the entire site, except for very limited cultivation of predominantly lucerne in the Ongers River valley, in the east. However this area, at the bottom of a valley will not be impacted by turbines which will preferentially be situated on higher lying ground.

There are only two farmsteads on the site, one of which is largely abandoned and has only a few workers houses still occupied.

6.4.4 Status of the land

The veld is in reasonable condition across the site. There are several places where erosion gullies have formed (see Figure 6.3) but none are very extensive or severe. There is no evidence of other significant degradation on the site. The soils are susceptible to erosion by water.

6.4.5 Possible land use options for the site

Given the severe climatic, terrain and soil constraints, the only viable agricultural land use option is small stock farming.

6.5 IDENTIFICATION OF KEY ISSUES AND POTENTIAL IMPACTS

6.5.1 Key Issues Identified During the Scoping Phase

The potential agricultural issues identified during the scoping phase of this EIA process were:

- Loss of agricultural land use on the footprint of the wind farm infrastructure.
- Erosion due to alteration of the land surface run-off characteristics.
- Generation of multiple land use income from combined sheep farming and wind farm lease.
- Increased livestock predation due to changes in predator behaviour.

6.5.2 Key Issues Identified During the Public Consultation Process

The potential agricultural issues identified during the public consultation phase of this EIA process were:

- Increase in certain livestock diseases that have insect vectors, due to decline in bat populations.
- Discontinuation of sheep farming on site.
- Change in the agricultural character of the area.
- Increased dust on lucerne fields.

6.5.3 Identification of Potential Impacts

The potential impacts identified during the EIA assessment are:



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6.5.3.1 All phases – Construction, operation, decommissioning

- Loss of agricultural land use on the footprint of the wind farm infrastructure.
- Erosion due to alteration of the land surface run-off characteristics.
- Generation of multiple land use income from combined sheep farming and wind farm lease.
- Discontinuation of sheep farming on site.
- Increased livestock predation due to changes in predator behaviour.
- Change in the agricultural character of the area.

6.5.3.2 Construction and decommissioning phases only

- Degradation of veld vegetation.
- Loss of topsoil.
- Increased dust on lucerne fields.

6.5.3.3 Operational phase only

- Increase in certain livestock diseases that have insect vectors, due to decline in bat populations.

6.5.3.4 Cumulative Impacts

- Regional loss of agricultural resources and production.

6.6 PERMIT REQUIREMENTS

Approval of the wind farm may be required from Department of Agriculture in terms of the Conservation of Agricultural Resources (CARA) Act, 43 of 1983 and the Sub-division of Agricultural Land (SALA) Act, 70 of 1970. Approval in terms of SALA is required for long term lease, even if no subdivision is required for the project. A separate CARA permit application is not required. Only written approval based on the EIA is required from Department of Agriculture.

6.7 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

ALL PHASES: CONSTRUCTION, OPERATION AND DECOMMISSIONING

6.7.1.1 Potential impact 1: Loss of agricultural land use on the footprint of the wind farm and electricity connection infrastructure.

The occupation of the footprint, which includes all access roads, will effectively take the land on the footprint out of agricultural production. There are 3 factors that result in this impact being of low significance:

1. The site has very low agricultural production potential, with a land capability of class 7 non-arable, low potential grazing land.



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2. Farming on the site is very extensive rather than intensive and so a loss of small portions of land has very little impact.
3. The actual footprint of the facility and therefore the area of land that will be directly impacted is extremely small. The exact footprint of this facility has not been calculated, but the footprint of wind farms of this scale is typically in the region of or less than 1% of the surface area. The rest of the land can continue to be used for agriculture as before. The actual footprint of impact of the power lines and Gamma substation are similarly tiny in comparison to available land.

Given the above factors, the economic consequences of this loss of production are negligible and are likely to be more than compensated for by the wind farm lease.

This is an unavoidable impact for which there are no mitigation measures.

6.7.1.2 Potential impact 2: Erosion due to alteration of the land surface run-off characteristics.

Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads. Erosion can lead to loss of soil resources, both at the point of disturbance and downstream of it.

Mitigation measures inherent to the project design include:

- Implement an effective system of run-off control which collects and safely disseminates run-off water from hardened or increased run-off surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.

6.7.1.3 Potential impact 3: Generation of multiple land use income from combined sheep farming and wind farm lease.

This makes a positive contribution to farming cash flow, and can therefore support agricultural activity and improve its financial sustainability.

There are no enhancement measures for this impact.

6.7.1.4 Potential impact 4: Discontinuation of sheep farming on site.

The alternative source of land use income from the lease to wind farming could remove the motivation for land owners to continue sheep farming on site. This could lead to lower production, with impacts for national food security.

However, the low production potential of the site means that discontinued sheep farming on it would have negligible impact on regional production or national food security. Furthermore the wind farm in no way changes the profitability of farming on the land. The loss of productive land is negligible (see impact 1). It only provides an additional source of income. So the land owner's decision to farm or not should not be influenced by the wind farm, and is likely to remain a function of the profitability of farming on the site.

There are no mitigation measures for this impact.



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6.7.1.5 Potential impact 5: Increased livestock predation due to changes in predator behaviour.

Two factors have been identified that could lead to movement of predators (caracal and jackal) out of the mountainous area where the wind farm is proposed and into neighbouring farmland, with the result that predation of lambs is increased in farm lands surrounding the wind farm. The first factor is that the noise of the turbines may reduce the population of natural prey species because many rely on hearing for protection. This could lead to a lack of prey which necessitates predators to seek other prey in surrounding areas. The second factor is that increased human presence and activity, especially during the construction phase, may chase predators from the mountainous wind farm site into surrounding farmland.

The assessment of this issue lies more in the specialist field of terrestrial ecology than in agriculture, and especially the turbine noise impact on natural prey species has been covered in the terrestrial ecology specialist report in some detail. This report concludes that a causal pathway from turbine noise to increased levels of predation on livestock is extremely unlikely. It is possible but not very likely that construction activities would chase predators from the mountainous area, as they are likely to hide in inaccessible parts that are not much affected by the construction. At worst it may affect a few pairs of animals, and so the impact would be minor.

This is an unavoidable, but highly unlikely impact for which there are no mitigation measures.

6.7.1.6 Potential impact 6: Change in the agricultural character of the area.

The presence of wind turbines in the landscape and the human activity associated with wind farming will have an impact on the agricultural character of the area. This impact is partly related to the visual impact and so is covered in that specialist report. The two electricity connection projects will have no impact on the agricultural character of the area as power lines and substations are already a common feature of the Karoo agricultural landscape.

This is also an unavoidable impact of the development for which there are no mitigation measures.

CONSTRUCTION AND DECOMMISSIONING PHASES ONLY

6.7.1.7 Potential impact 7: Degradation of veld vegetation.

Veld vegetation will be degraded on any areas disturbed during construction, including any areas over which vehicles pass.

Mitigation measures inherent to the project design include:

1. Minimise footprint of disturbance.
2. Confine vehicle access on roads only



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6.7.1.8 Potential impact 8: Loss of topsoil.

Topsoil may be lost due to poor topsoil management during construction related soil profile disturbance (leveling, excavations etc).etc. Lack of topsoil will decrease the rehabilitated soil's ability to support vegetation, leading to a further degradation of soil through erosion.

Mitigation measures inherent to the project design include:

1. Strip and stockpile topsoil from all areas where soil will be disturbed.
2. After cessation of disturbance, re-spread topsoil over the surface.
3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.

6.7.1.9 Potential impact 9: Increased dust on lucerne fields.

The neighbouring farm has lucerne fields next to the main public road to the wind farm site. An increase in, particularly heavy vehicle traffic, along this road during construction will increase the amount of dust that is deposited on the lucerne fields, which will impact negatively on lucerne production.

Key mitigation measures proposed by specialist include:

1. Impose strict speed limits on all construction vehicles along this section of road.
2. Spray this section of road with water only if and when monitoring indicates unacceptably high levels of dust generation to prevent water wastage in this water scarce area.

OPERATIONAL PHASE ONLY

6.7.1.10 Potential impact 10: Increase in certain livestock diseases that have insect vectors, due to decline in bat populations.

If there is a decline in bat populations then there may be an increase in insect populations, including those that are vectors of livestock diseases. This could cause increased incidence of livestock diseases such as Rift Valley Fever.

The realisation of this impact would only come about as a result of a significant decline in bat populations. However a decline in bat populations will be avoided by implementation of the mitigation measures stipulated in the bat specialist report (see Chapter 8 of this Draft EIA Report).

CUMULATIVE IMPACTS

6.7.1.11 Cumulative impact 1: Regional loss of agricultural resources and production.

There could be a cumulative regional loss of agricultural resources and production as a result of other developments on agricultural land in the region. However as has already been discussed under potential impact 1 above, the loss is insignificant because of the low

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agricultural production potential of the land, the extensive nature of the farming, and because the actual footprint of loss is extremely small.

There are no mitigation measures for this impact.

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6.1 IMPACT ASSESSMENT SUMMARY

A summary of the assessments of all impacts for the three related projects is provided in table format in the tables below.

6.1.1 Project 1 : Ishwati Emoyeni Wind Energy Facility

Table 6.2: Impact assessment summary table for all phases – construction, operation & decommissioning

Nature of Impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Loss of agricultural land use	Site specific	Long term	Low	Definite	High	Low	None	Very low Negative	Very low Negative	High
Erosion	Site specific	Long term	Low	Highly probable	Low	Low	<u>Mitigation measures inherent to the project design include:</u> Implement an effective system of run-off control which collects and safely disseminates run-off water from hardened or increased run-off surfaces and prevents potential down slope erosion.	Low Negative	Low Negative	High
Multiple land use income	Site specific	Long term	Low	Highly probable	High	Low		Low Positive	Low Positive	High
Discontinuation of sheep farming	Site specific	Long term	Low	Probable	High	Low		Very low Negative	Very low Negative	High
Increased livestock predation	Local	Long term	Low	Improbable	High	Replaceable	None	Low Negative	Low Negative	Low

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Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Change in agricultural character	Local	Long term	Low	Highly probable	Low	Moderate	None	Low Neutral	Low Neutral	Medium

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Table 6.3: Impact assessment summary table for the construction and decommissioning phases only

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Veld degradation	Site specific	Short term	Low	Probable	High	Low	<u>Mitigation measures inherent to the project design include:</u> 1. Minimize footprint of disturbance. 2. Confine vehicle access on roads only	Low Negative	Very low Negative	High
Loss of topsoil	Site specific	Long term	Low	Probable	Moderate	Low	<u>Mitigation measures inherent to the project design include:</u> 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	Low Negative	Very low Negative	High
Dust in lucerne fields	Local	Short term	Low	Probable	High	Low	<u>Key mitigation measures proposed by specialist include:</u> 1. Impose strict speed limits on all construction vehicles along this section of road. 2. Spray this section of road with water during times of high traffic.	Low Negative	Very low Negative	High

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Table 6.4: Impact assessment summary table for the operational phase only

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Increase in livestock disease	Local	Long term	Medium	Improbable	Moderate	Low	None	Low Negative	Low Negative	Low

Table 6.5: Impact assessment summary table for the Cumulative Impacts

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Cumulative impacts										
Regional loss of agricultural land	Regional	Long term	Low	Probable	High	Low	None	Very low Negative	Very low Negative	High

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6.1.2 Project 2: Servitude and three double circuit 132 kV power lines between wind farm and Eskom's Gamma Substation

Table 6.6: Impact assessment summary table for all phases – construction, operation & decommissioning

Nature of Impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Loss of agricultural land use	Site specific	Long term	Low	Definite	High	Low	None	Very low Negative	Very low Negative	High
Erosion	Site specific	Long term	Low	Highly probable	Low	Low	<u>Mitigation measures inherent to the project design include:</u> Implement an effective system of run-off control which collects and safely disseminates run-off water from hardened or increased run-off surfaces and prevents potential down slope erosion.	Low Negative	Low Negative	High

Table 6.7: Impact assessment summary table for the construction and decommissioning phases only

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Veld degradation	Site specific	Short term	Low	Probable	High	Low	<u>Mitigation measures inherent to the project design include:</u> 1. Minimize footprint of disturbance. 2. Confine vehicle access on roads only	Low Negative	Very low Negative	High

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Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Loss of topsoil	Site specific	Long term	Low	Probable	Moderate	Low	<u>Mitigation measures inherent to the project design include:</u> 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.	Low Negative	Very low Negative	High

Table 6.8: Impact assessment summary table for the Cumulative Impacts

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Regional loss of agricultural land	Regional	Long term	Low	Probable	High	Low	None	Very low Negative	Very low Negative	High

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Project 3: 400/132 kV substation yard at Gamma Substation

Table 6.9: Impact assessment summary table for all phases – construction, operation & decommissioning

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Loss of agricultural land use	Site specific	Long term	Low	Definite	High	Low	None	Very low Negative	Very low Negative	High
Erosion	Site specific	Long term	Low	Highly probable	Low	Low	<u>Mitigation measures inherent to the project design include:</u> Implement an effective system of run-off control which collects and safely disseminates run-off water from hardened or increased run-off surfaces and prevents potential down slope erosion.	Low Negative	Low Negative	High

Table 6.10: Impact assessment summary table for the construction and decommissioning phases only

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Veld degradation	Site specific	Short term	Low	Probable	High	Low	<u>Mitigation measures inherent to the project design include:</u> 1. Minimize footprint of disturbance. 2. Confine vehicle access on roads only	Low Negative	Very low Negative	High
Loss of topsoil	Site specific	Long term	Low	Probable	Moderate	Low	<u>Mitigation measures inherent to the project design include:</u>	Low Negative	Very low Negative	High

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Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplacability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
							<ol style="list-style-type: none"> 1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil. 			

Table 6.11: Impact assessment summary table for the Cumulative Impacts

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Irreplacability	Mitigation/ Management Actions	Significance and Status		Confidence level
								Without Mitigation	With Mitigation	
Regional loss of agricultural land	Regional	Long term	Low	Probable	High	Low	None	Very low Negative	Very low Negative	High



6.8 CONCLUSION AND RECOMMENDATION

The proposed wind farm is located on a mountainous plateau in the central Karoo and the associated Eskom grid connection infrastructure is located on Karoo plains to the west of it. The agricultural capability of the site is extremely limited. Land capability over the majority of the site is classified as class 7 – non-arable, low potential grazing land. The other parts of it are classified as class 8, the lowest land capability class, which is non-utilisable wilderness land. Limitations are aridity and lack of available water, shallow, rocky soils and mountainous terrain. The land is used for sheep farming, which is the only possible agricultural land use, given the extreme constraints.

There are 3 important factors that result in agricultural impacts being of low significance:

1. The very low agricultural production potential of the land.
2. Farming on the site is very low intensity and so a loss of small portions of land has very little impact.
3. The actual footprint of the facility and therefore the area of land that will be directly impacted is extremely small. The exact footprint of this facility has not been calculated, but the footprint of wind farms of this scale is typically in the region of or less than 1% of the surface area. The rest of the land can continue to be used for agriculture as before. The actual footprint of impact of the power lines and Gamma substation are similarly tiny in comparison to available land.

Approval of the wind farm may be required from Department of Agriculture in terms of the Conservation of Agricultural Resources (CARA) Act, 43 of 1983 and the Sub-division of Agricultural Land (SALA) Act, 70 of 1970. Approval in terms of SALA is required if the project company plans to lease only part of a surveyed and registered portion of land for which the property owner has a title deed.. A separate CARA permit application is not required. Only written approval based on the EIA is required from Department of Agriculture.

Proposed mitigation measures that have been carried over into the EMP include:

All phases – Construction, operation and decommissioning:

Implement an effective system of run-off control which collects and safely disseminates run-off water from hardened or increased run-off surfaces and prevents potential down slope erosion.

Construction and decommissioning phases only:

1. Minimize footprint of disturbance.
2. Confine vehicle access on roads only
3. Strip and stockpile topsoil from all areas where soil will be disturbed.
4. After cessation of disturbance, re-spread topsoil over the surface.
5. Dispose of any sub-surface, clay spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
6. Impose strict speed limits on all construction vehicles along the section of road with adjacent lucerne fields.
7. Spray this section of road with water only if and when monitoring indicates unacceptably high levels of dust generation to prevent wastage of in this water scarce area.

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APPENDIX 6.1: SOIL DATA

Table A6-1. Land type soil data for site. All soil series that occupy 2 % or more of land surface are listed.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Topsoil clay%	Subsoil clay %	Depth limiting layer	% of land type
Fc131	7	Mispah	5-10	10-15		R, so	36
		Valsrivier	60-120	15-25	35-45	vr, vp	11
		Hutton	10-40	15-25	15-25	R	11
		Rock outcrop	0			R	10
		Oakleaf	30-80	15-20	20-30	R	8
		Glenrosa	20-30	10-25	20-35	so	7
		Swartland	30-50	15-25	30-45	so	6
lb126	8	Rock outcrop	0			R	63
		Mispah	5-10	15-25		R	19
		Valsrivier	30-80	20-30	35-45	vr, vp	5
		Glenrosa	5-10	15-25	15-35	R	5
Da147	7	Swartland	20-50	10-15	25-40	Vp	19
		Mispah	5-15	10-20		R, ca	15
		Valsrivier	50-120	10-15	25-40	vp	14
		Oakleaf	40-120	10-20	25-40		13
		Glenrosa	15-30	10-20	15-40	R, so	9
		Hutton	20-60	10-15	15-25	R, ca	7
		Rock outcrop	0			R	5
la94	7	Oakleaf	>120	6-15	15-35	R	77
		Swartland	5-15	6-15	35-55	vr	6
		Glenrosa	5-20	15-25	15-35	so	5
Fb488	7	Rock outcrop	0			R	21
		Mispah	5-15	10-20		R	20
		Swartland	20-30	10-20	35-40	vp	15
		Hutton	10-30	10-20	15-20	R	15
		Mispah	5-15	10-20		ca	13
		Glenrosa	10-30	10-20	20-30	so	9
		Oakleaf	40-60	10-20	15-30	R	8

Land capability classes: 7 = non-arable, low potential grazing land; 8 = non-utilisable wilderness land.

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