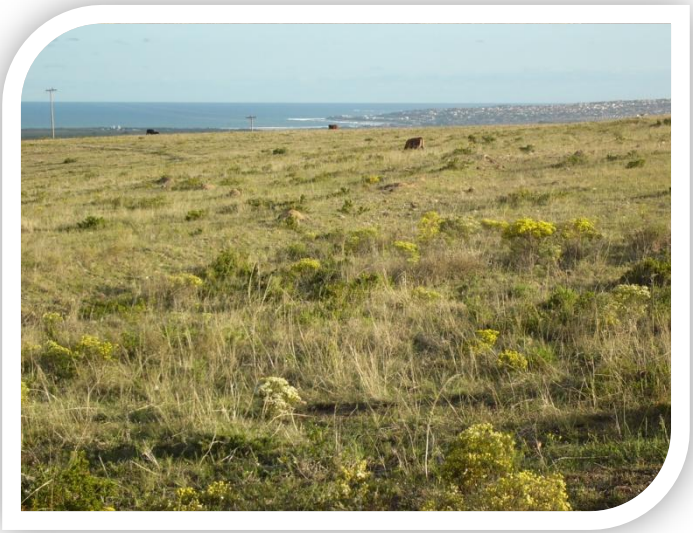
Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Final Environmental Impact Assessment Report

Chapter 13: Supporting Technical Inputs

Contents

Tables

Figures



CHAPTER 13. SUPPORTING TECHNICAL INPUTS

This chapter provides supporting technical inputs on the potential impacts of the proposed Ubuntu wind energy project on the site's agricultural production and resource base.

13.1 INTRODUCTION

Johann Lanz was contracted by CSIR and WKN-Windcurrent SA to undertake an agricultural study of the site of the proposed Ubuntu wind energy project on the farms Zuurbron & Vlakteplaas located approximately 10 kilometres north north west of Jeffrey's Bay (See Figure 13.1).

The aim of the agricultural study was to investigate the potential impacts of the proposed development on the site's agricultural production and resource base. The terms of reference for the study were set out in correspondence from the Department of Environmental Affairs dated 07/07/2011, DEA ref: 12/12/20/1752. These terms of reference are taken from the department of agriculture, forestry and fisheries draft document: *Regulations for the evaluation and review of applications pertaining to wind farming on agricultural land*.

These terms of reference include:

- Mapping of soil forms and identification of the following soil characteristics
  - soil depth
  - soil colour
  - clay content
  - limiting factors
- Indication of the slope of the site;
- Identification of land use, developments and access routes on and surrounding the site;
- Assessment of the status of the land including erosion, vegetation and degradation;
- Description of water availability, source and quality;
- Identification of possible land use options for the site and discussion of why agriculture should or should not be the land use of choice; and
- An assessment of the impact of the development on agriculture.

13.2 METHODOLOGY

The field investigation was aimed at achieving an understanding of soil types and soil variation across the site. It did not comprise a detailed soil mapping exercise, based on a grid of profile test pits, but was based on an overview assessment, which involved driving and walking fairly extensively across the sites, investigating several exposed cuttings, assessing topography, surface conditions and geological maps, and drilling a number of (shallow) auger holes. The exposed cuttings included deep, old and existing quarry excavations, a deep road cutting and several culvert cuttings which provided access to sub soil horizons. The field assessment was

complimented by the soil scientist's experience of a previous detailed soil mapping exercise undertaken on the neighbouring property. The investigation focused on the area of impact, that is where turbine and other infrastructure locations are proposed, and not on additional parts of the effected farms. The field assessment was done between 13th and 15th July 2011. A total of 23 sample points were investigated and recorded across the site.

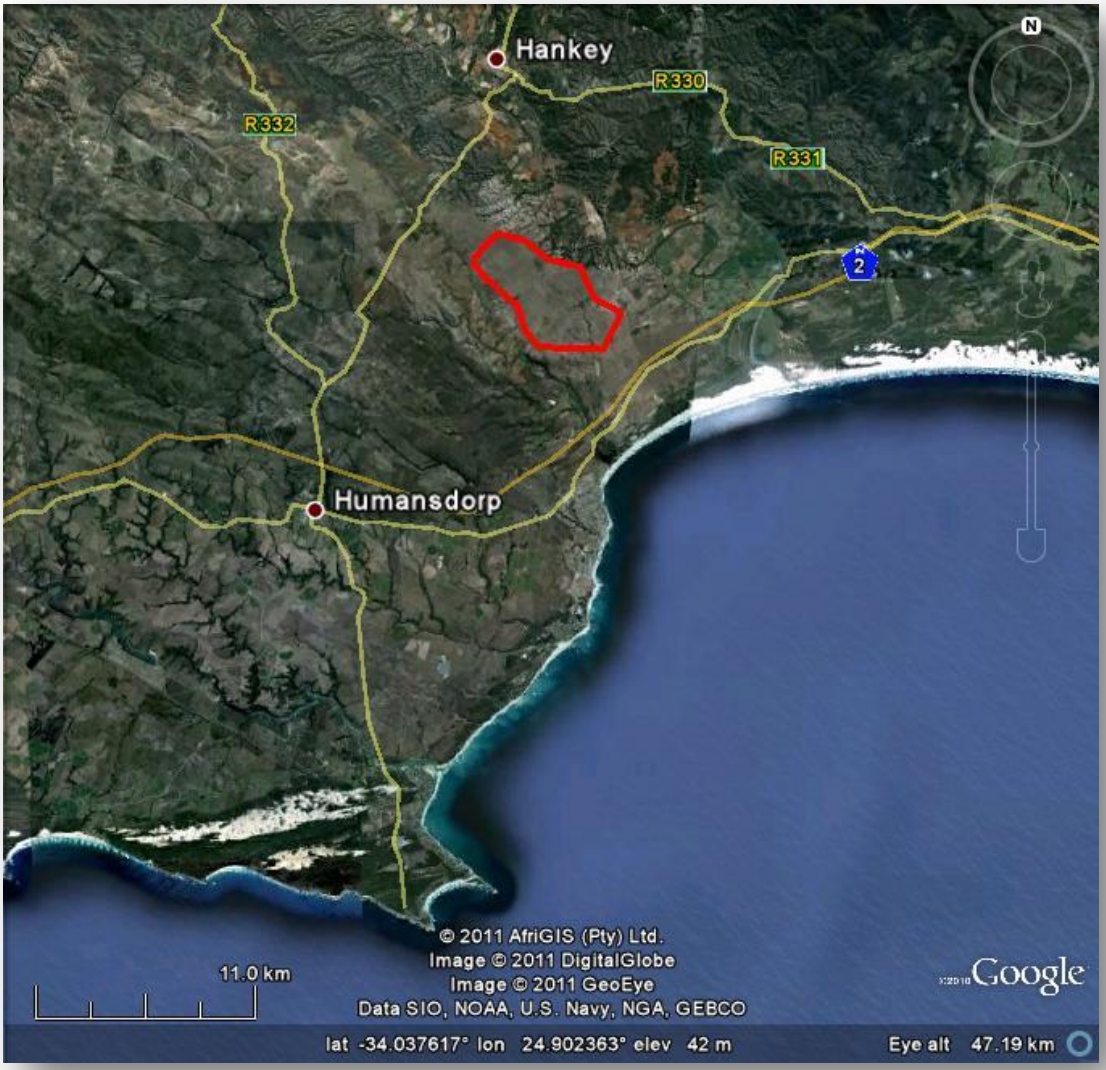


Figure 13.1: Locality map of the proposed Ubuntu wind energy project. Site shown in red.

This soil investigation methodology was considered completely adequate to gain a sufficiently accurate assessment of the agricultural soil capability across the site. A more detailed soil investigation, while able to map more detailed soil boundaries, is unlikely to have added anything significant to the assessment of agricultural soil capability for the purposes of determining the impact of wind farming on agricultural productivity.

The evaluation of soils for agricultural suitability is an evaluation of the soil's inherent physical and chemical fertility. The evaluation is done largely in terms of the presence or absence of soil limitations that will limit crop growth. The following factors play an important role in the assessment of agricultural suitability: root development potential, which is dependent on soil depth and structure; water holding capacity; drainage; workability; and soil organic matter content. An overall assessment of each soil is made taking all these factors into account, to give an assessment of soil capability. A distinction is made between soil capability and land capability. Soil capability only takes soil factors into account. Land capability is the combination of soil capability and climate factors.

13.3 SOIL CONDITIONS AND AGRICULTURAL CAPABILITY OF THE SITE

The positions of all investigated sample points for the site are indicated in Figure 13.2. Data from the profiles of each sample are provided in Table 13.1. Photographs of site conditions and representative soil profiles are given in Figures 13.3 to 13.8.

The proposed wind farm is located on an elevated, flat plateau. The area is underlain by fluvial conglomerates of the Mesozoic Enon Formation (Uitenhage Group) that are characterised by an abundance of rounded cobble stones of various sizes. The soils are predominantly residual soils that have been derived from the weathering of these underlying conglomerates and are characterised by an abundance (±80%) of the rounded cobble stones throughout the profile. The soil material between the stones has a clay content of approximately 8% with a medium sand grade. They are well drained soils with a brown A horizon and yellow-brown to orange B horizon. Most of the soils do not have a specific depth limiting horizon within 80cm of the soil surface.

The soils are classified in terms of the South African soil classification system as Clovelly soil form. They fall within this soil form, not because of a high degree of weathering but because they are young, well drained soils derived from parent material with a low clay forming potential and consequently develop non-structured yellow-brown profiles.

Although the majority of the area comprises these residual soils where active downward weathering is taking place, there are localised, small valley areas where eroded material has accumulated. These soils are less well drained and have non-stony upper soil horizons. Investigated soil in such areas was classified as Tukulu soil form.

Apart from this variation, soil conditions are very uniform across the site. The proposed turbines are all located on the plateau area and not in the valleys.

In terms of soil limitations to agricultural production, the soils are limited by the very high stone content which serves as a mechanical limitation to cultivation. It also severely limits the total water holding capacity and nutrient holding capacity of the soils, which is further limited by the low clay content as well. The soils are therefore categorised as medium agricultural potential.

Table 13.1: Soil data from all investigated sample profiles on the site. Top soil refers to the A horizon and sub soil to the B horizon. Effective depth is indicated as > the hole depth, where this did not reach a limiting horizon.

No	Form & family	Effective depth (depth to limiting horizon) (cm)	Type of limiting horizon	Sand grade & clay %		Slope %	Soil potential category	Sample type	GPS co-ordinates Lat/Lon hddd.ddddd°
				top soil	sub soil				
1	Clovelly 2100	>150		med, 9	med, 9	1	medium	quarry	S33.90443 E24.87341
2	Clovelly 2100	>80		med, 9	med, 9	1	medium	culvert	S33.90538 E24.87595
3	Clovelly 2100	>80		med, 9	med, 9	1	medium	culvert	S33.90635 E24.87878
4	Clovelly 2100	>80		med, 9	med, 9	1	medium	culvert	S33.91048 E24.88600
5	Clovelly 2100	>80		med, 9	med, 9	1	medium	culvert	S33.91556 E24.89058
6	Clovelly 2100	>25		med, 15		1	medium	auger	S33.91790 E24.89242
7	Clovelly 2100	>80		med, 8	med, 8	1	medium	culvert	S33.92143 E24.89575
8	Clovelly 2100	>80		med, 8	med, 8	1	medium	culvert	S33.92402 E24.89975
9	Clovelly 2100	>80		med, 8	med, 8	1	medium	culvert	S33.92556 E24.90354
10	Clovelly 2100	>80		med, 8	med, 8	1	medium	culvert	S33.92877 E24.91110
11	Clovelly 2100	>80		med, 6	med, 8	3	medium	culvert	S33.93153 E24.91537
12	Tukulu 2110	>60		med, 8	med, 8	1	medium	auger	S33.93305 E24.91815
13	Clovelly 2100	80	cemented layer	med, 8	med, 8	5	medium	quarry	S33.93476 E24.91696
14	Clovelly 2100	>100		med, 8	med, 8	3	medium	cutting	S33.93406 E24.91940
15	Clovelly 2100	>80		med, 8	med, 8	7	medium	culvert	S33.93833 E24.92653
16	Clovelly 2100	>15		med, 8		2	medium	auger	S33.93926 E24.93637
17	Clovelly 2100	130	cemented layer	med, 8	med, 8	2	medium	quarry	S33.95153 E24.94040
18	Clovelly 2100	>60		med, 8	med, 8	2	medium	ditch	S33.95828 E24.92592
19	Clovelly 2100	>15		med, 8		1	medium	auger	S33.95028 E24.90171
20	Clovelly 2100	>15		med, 8		1	medium	auger	S33.93398 E24.89651

No	Form & family	Effective depth (depth to limiting horizon) (cm)	Type of limiting horizon	Sand grade & clay %		Slope %	Soil potential category	Sample type	GPS co-ordinates Lat/Lon hddd.ddddd°
				top soil	sub soil				
21	Clovelly 2100	>15		med, 8		1	medium	auger	S33.92496 E24.87934
22	Clovelly 2100	>15		med, 8		1	medium	auger	S33.91567 E24.87160
23	Clovelly 2100	>15		med, 8		1	medium	auger	S33.92561 E24.91688

Notes:

1. *Sample positions that differed from the norm were sample 6 which was in a pan area and which had accumulated a deeper, richer, non-stony A horizon, and sample 12 in a valley area of sand accumulation which was non-stony throughout the investigated depth, and of a different soil form.*
2. *In the quarry cuttings of samples 13 and 17, the cemented layer was present in places but not throughout.*

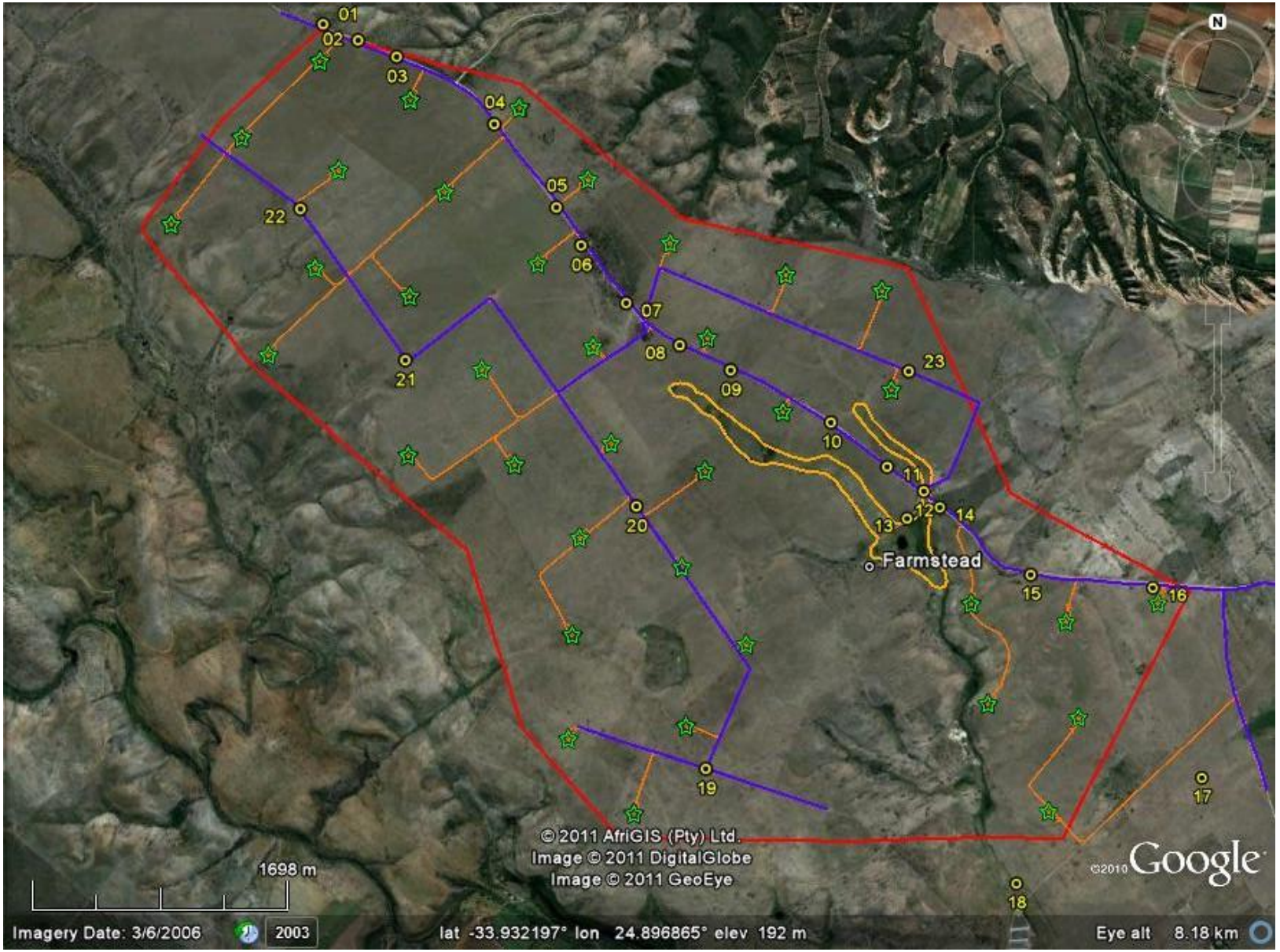


Figure 13.2: Google Earth Map of Wind Farm Site. The map shows the proposed positions of all turbines as green stars, soil investigation points are numbered in yellow, existing access roads are blue, proposed new access roads are orange, and the boundary of the Tukulu soil form, which differs from the Clovelly form on the remainder of the site, is light brown.

The agricultural potential of an area is influenced by both soil and climate parameters. Land capability is the combination of soil capability and climate factors. On the AGIS data base, the site has a land capability classification as: Non-arable, low to moderate potential grazing land. On the South African National Grazing Capacity Map the site is within zone 431, and classified as having a grazing capacity of 6 hectares per large stock unit.

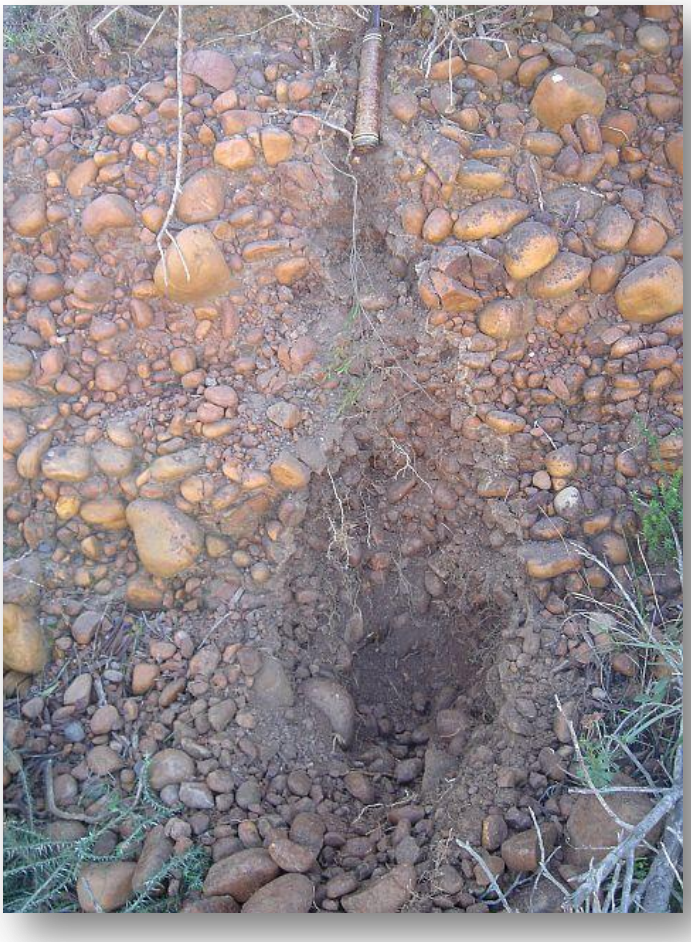


Figure 13.3: Typical Clovelly soil profile, sample 13.

Figure 13.4: Piece of still cemented, un-weathered conglomerate, from which the soils have been derived.

Figure 13.5: Landscape of site with public road.

Figure 13.6: Showing abundant surface stone where it has been exposed by cattle trampling.

Figure 13.7: Camp with established permanent pasture.

Figure 13.8: Camp with natural veld pasture.

13.4 CURRENT LAND USE AT THE SITE

The entire site and its immediate surroundings are currently used as dry land grazing for beef cattle. There are no irrigated areas on the site. The area is divided into fenced grazing camps. On some of these, permanent pastures of various grasses have been established. On others natural veld is utilized as grazing. Wheat cultivation took place on some of the area, but was stopped more than twenty years ago because it was not economically viable. There is one farm stead on the site with an old barn and labourers cottages. In terms of access routes, there is a public gravel road that runs through the site, and private access roads to the grazing camps have been established for the cattle farming. All access roads are in good condition. Access roads and buildings are shown in Figure 13.2.

13.5 STATUS OF THE LAND

The land is generally in good condition. There is very little evidence of erosion or degradation of any kind. Apparently wind erosion of the topsoil was a problem when lands were cultivated annually (Frank Weitz, *pers. comm*.) Vegetation is predominantly grasses, either established, permanent pastures or land that probably had greater thicket cover, but that was cleared in the past.

13.6 POSSIBLE LAND USE OPTIONS FOR THE SITE

Dry land grazing for beef cattle is the only agricultural land use that is currently considered economically viable for the site, and so should be the land use of choice. This can easily be continued concurrently with the wind farming, providing a multiple land use option that increases revenue from the land.

13.7 WATER AVAILABILITY

The northern part of the farm Zuurbron, 4 km north west of the wind farm site and north of the R330 to Hankey, has a good quantity and quality of water available from three boreholes located there. These are used for irrigation lands in that part of the farm, and are used to supply stock water and the farmstead water to the wind farm site.

13.8 IMPACTS OF THE WIND FARM ON AGRICULTURE

The following impacts on agriculture are identified and discussed:

13.8.1 Permanent loss of agricultural land on the turbine footprints, roads and other infrastructures

A small amount of the land will be lost to current and future agricultural production. The extent of this is given in Table 13.2. The permutations of turbine size and number must still be finalised for the development. The calculation given in Table 13.2 is based on the maximum footprint area of the various options, which is a total of 15 hectares for the site. The total site area is 4,200 hectares. The approximate total area of agricultural land lost to the wind farm therefore represents a mere 0.36% of the agricultural land on the site.

Table 13.2: Calculation of the wind farm footprint on agricultural land.

	Length (m)	Width (m)	Area (m^2)	Number	Area (ha)
New roads	12000	4.5	54000	1	5.4
Hard standing for crane	50	40	2000	40	8
Foundation	20	20	400	40	1.6
Total					15

Mitigation: For all excavations that are to be returned to agricultural use (e.g. buried cables), the upper 20cm of the soil must be stripped, stockpiled separately, and then re-spread over the surface of the excavation after backfilling with excavated subsoil. The wind farm should utilise existing roads wherever possible and the length of any new roads should be minimised. **Note**: this has already been done in the proposed layout.

Significance: This impact is considered to be of low significance given that the area of land that will be lost to agriculture is very small, especially in relation to available land, that the land lost is only of medium agricultural potential, that current agricultural activities can be continued with very minimal disturbance, and that any potential future agricultural activities that are viable under the existing natural agricultural resource base (climate, water and soil) are also unlikely to be significantly disturbed by the existence of the wind farm.

13.8.2 Interruption of current agricultural activities

Activities associated with the construction and operation of the wind farm may interrupt current agricultural activities.

Mitigation: The layout of the wind farm should be such that it poses minimum interruption of agricultural activities. Turbine positions should not block access to farming operations and kraals in particular. **Note**: this has already been done in the proposed layout.

Significance: As current agricultural activities will be able to continue con-currently with all phases of the wind farm development, with very minimal disturbance, this impact is considered to be of low significance.

13.8.3 Disturbance of run-off and resultant potential impact on erosion

The construction of hard stands, foundations and new roads can increase surface run-off and potentially lead to erosion.

Mitigation: Drainage systems for the control of run-off water where necessary must be put into place during the construction of the wind farm.

Significance: Much of the land is flat and well drained so run-off and potential erosion is not a large threat. Where necessary, on sloping areas, drainage systems can easily be put in place. This impact is therefore considered to be of low significance.

13.9 CONCLUSIONS

An overview investigation of soil conditions and agricultural capability at the site of the proposed Ubuntu Wind Energy Project north of Jeffrey's Bay was done. The aim of this study was to investigate the potential impacts of the proposed development on the site's agricultural production and resource base. This included an investigation of soils and other agricultural resources across the site.

The soil investigation was based predominantly on an investigation of existing cuttings on the site, in combination with assessing topography, geology and surface conditions, but shallow auger holes were also used in places. This soil investigation methodology was considered completely adequate to gain a sufficiently accurate assessment of the agricultural soil capability across the site.

Soil conditions and agricultural capability are very uniform across the site. The soils are well drained, yellow-brown, sandy soils with abundant stone throughout the profile, and are classified as Clovelly soil form in terms of the South African soil classification system. These soils are limited by the very high stone content which serves as a mechanical limitation to cultivation. It also severely limits the total water holding capacity and nutrient holding capacity of the soils, which is further limited by the low clay content. The soils are therefore categorised as having medium agricultural potential. The land capability (which includes both soil and climate factors) is classified as non-arable, low to moderate potential grazing land. It is classified as having a grazing capacity of 6 hectares per large stock unit.

Impacts on agricultural potential and productivity were identified as:

1. Loss of agricultural land;
2. Interruption of current agricultural activities; and
3. Disturbance of run-off and resultant potential impact on erosion

The approximate loss of agricultural land was determined as only 15 hectares which represents a mere 0.36% of the agricultural land on the site. Mitigation measures were recommended for some of the impacts. All the identified impacts on agricultural potential and productivity were considered to be of low significance.

In conclusion, the proposed wind farm seems to represent an opportunity for multiple land use on the site, with a very low level of disturbance to current or likely future agricultural productivity.