Environmental Impact Assessment for the proposed Banna Ba Pifhu Wind Energy Project near Humansdorp, Eastern Cape: Draft Environmental Impact Assessment Report

# Chapter 14:

# Supporting Technical inputs

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# CHAPTER 14. IMPACT ON AGRICULTURE

## 14.1 INTRODUCTION AND BRIEF

Johann Lanz was contracted by CSIR and WKN Windcurrent to undertake an Agricultural study of the site of the proposed wind energy project on the farm Broadlands, approximately 4 km to the south of the town of Humansdorp (see Figure 14.1). A site plan is provided in Figure 14.2. The aim of the study was to determine the impacts of the wind farm development on agricultural resources and production.

## 14.2 TERMS OF REFERENCE

The terms of reference for this report are the points numbered 2.3; 2.4; 3; 4; 5; 8 - 26 in Section C of the Department of Agriculture's document: *Regulations for the evaluation and review of applications pertaining to wind farming on agricultural land, dated 03/08/2011*. The terms of reference include:

1. Provision of a site plan
2. Mapping of soil forms and identification of the following soil characteristics
   - soil depth
   - soil colour
   - clay content
   - limiting factors
3. Indication of the slope of the site.
4. Identification of land use, developments and access routes on and surrounding the site.
5. Assessment of the status of the land including erosion, vegetation and degradation.
6. Identification of possible land use options for the site.
7. An assessment of the impact of the development on agriculture.
8. Rehabilitation plan to rehabilitate the roads after construction.

## 14.3 PROJECT DESCRIPTION

The project involves the following infrastructure establishment:

- The installation of 15 to 27 wind turbines of approximately 1.8 to 3.2 MW each with a hub height of between 80 to 105 meters and a blade diameter between 80 and 117 meters;
- Construction of concrete foundations to support the wind turbines (approximately 20 x 20 x 3m);
- A wind monitoring mast of 100 m high;
- Internal access roads to the turbines (5m wide), with the intent being to upgrade existing roads as far as possible;
- Underground internal electrical cabling between the wind turbines (will follow roads);
- An on-site substation for connection to the Eskom grid;
- Construction of hard standing areas for use by cranes during construction. Some of these areas will be retained for future maintenance use;

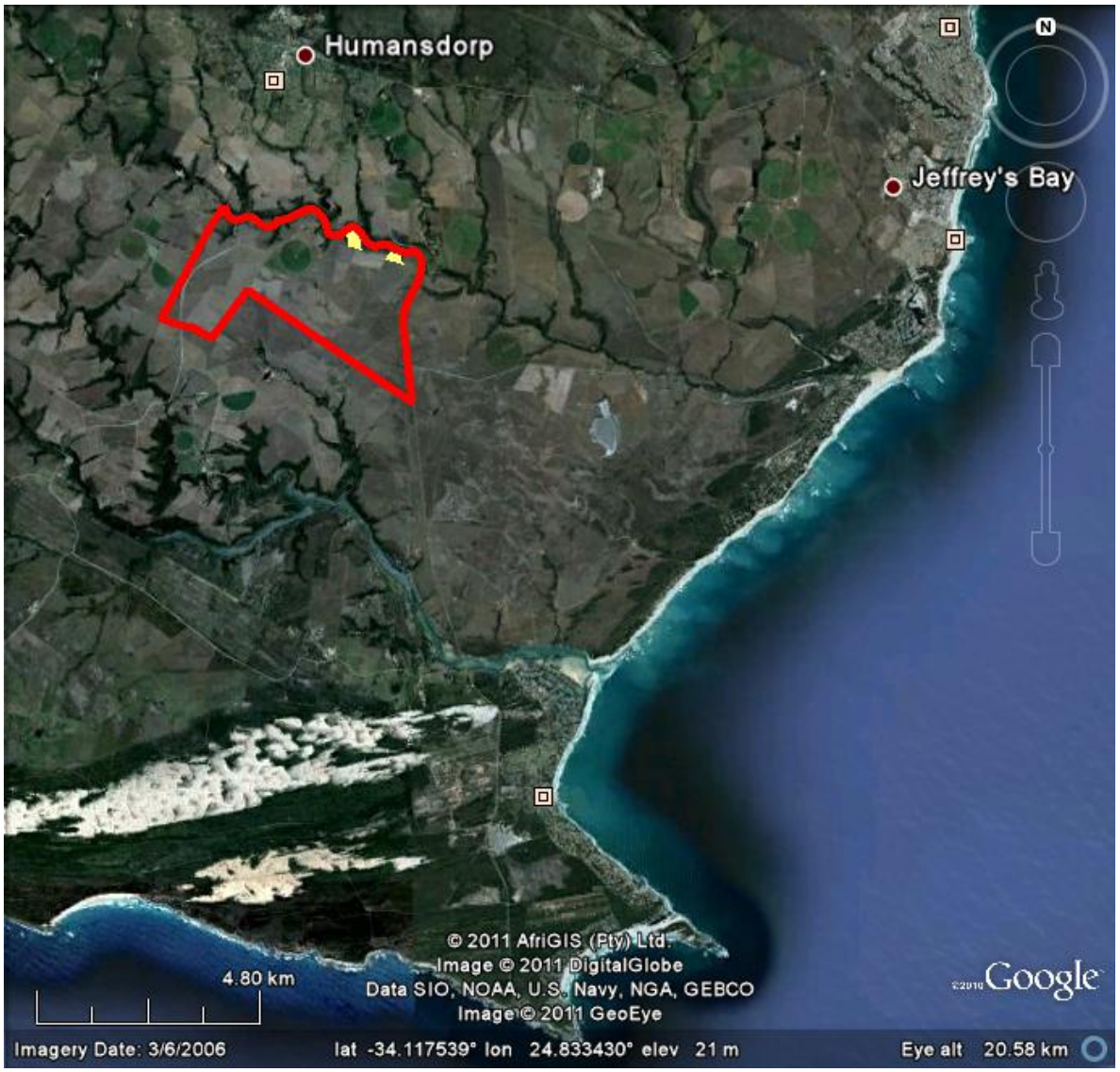


**Figure 14.1: Locality map of the proposed wind energy project on the farm Broadlands (outlined in red).**

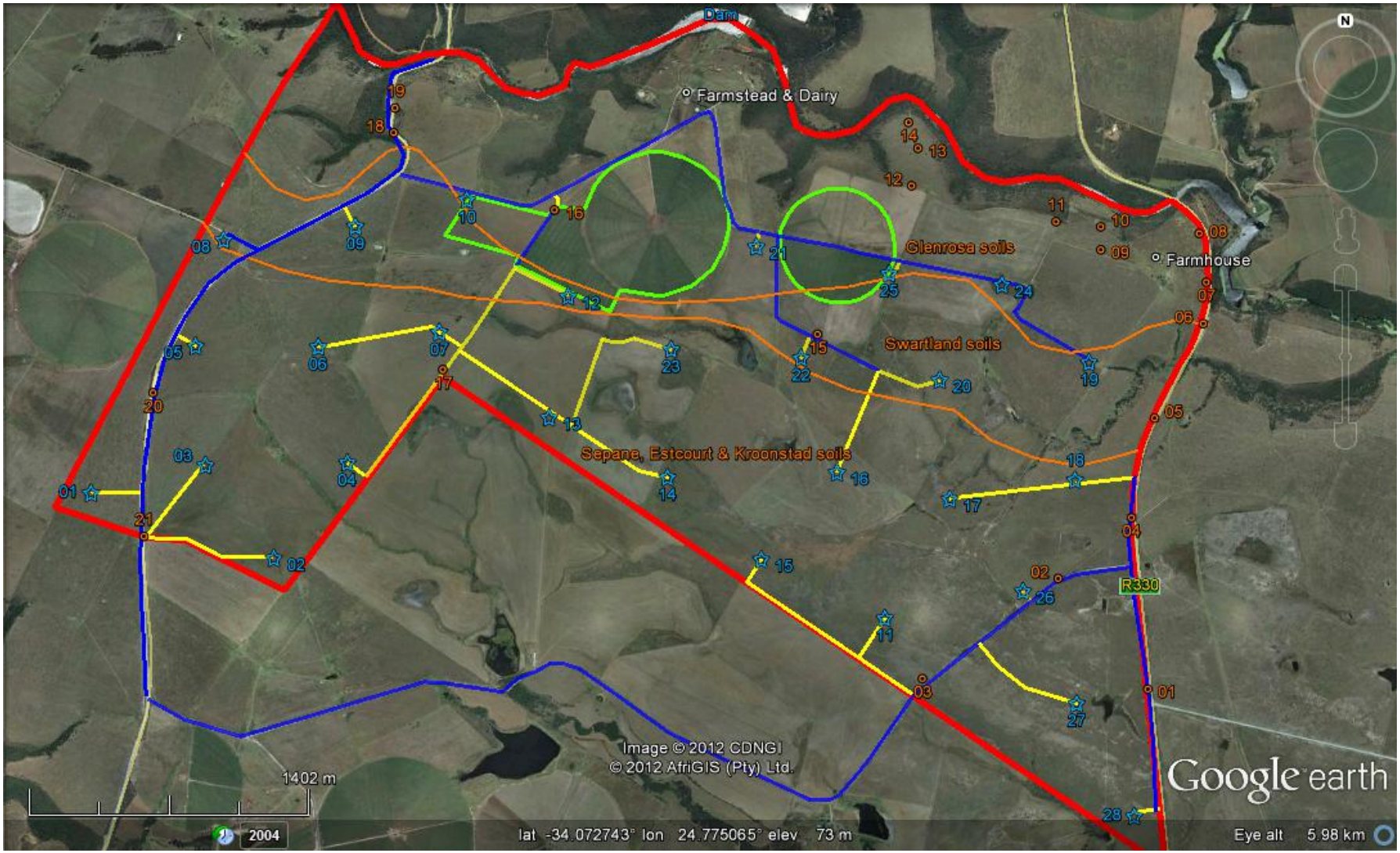


**Figure 14.2: Site Plan: Banna Ba Pifhu Wind Farm**

## 14.4 METHODOLOGY OF STUDY

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 site, investigating several exposed cuttings, and interpolating between them by assessing topography, surface conditions, geological maps, and drilling a number of (shallow) auger holes. The exposed cuttings were along the public roads on each side of the site. The field assessment was done between 13th and 15th July 2011. A total of 21 sample points were investigated and recorded across the site.

This soil investigation methodology provided an effective understanding of soil patterns in the area and was considered completely adequate to gain a sufficiently accurate assessment of the agricultural soil suitability 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 suitability for the purposes of determining the impact of the project on agriculture.

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 suitability. A distinction is made between soil suitability and land capability. Soil suitability only takes soil factors into account. Land capability is the combination of soil suitability and climate factors to determine agricultural suitability.

## 14.5 SITE TOPOGRAPHY (SLOPES)

An elevation profiles across the site is given in Figure 14.3, to illustrate the general topography and slope across the site. All the turbines have been located on slopes of less than or equal to 3%.

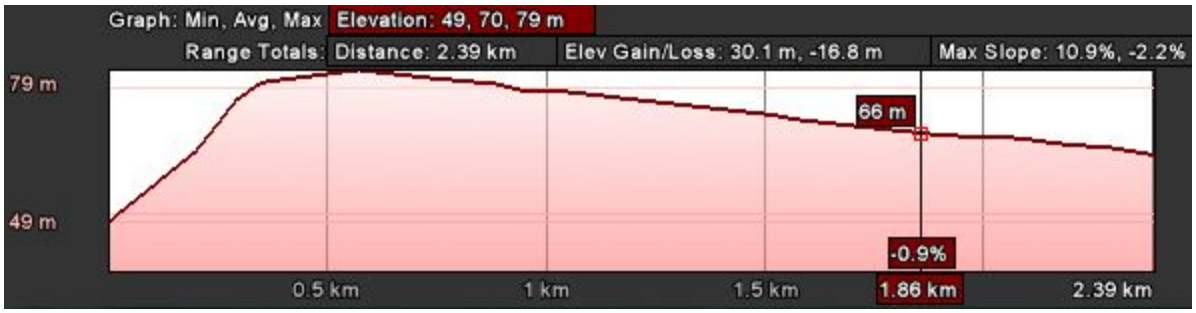


**Figure 14.3: Elevation profile across the site from northern boundary to southern boundary, running through turbine positions 25 and 11.**

## 14.6 SOIL CONDITIONS AND AGRICULTURAL SUITABILITY OF THE SITE

The positions of all investigated sample points across the whole farm are indicated in the site plan in Figure 14.2. Data from the profiles of each sample are provided in Appendix 14.1. Photographs of site conditions and representative soil profiles are given in Figures 14.4 to 14.9.

Broadlands farm on which the project is situated comprises a fairly flat portion of the low-lying (c. 40-90m amsl) southern coastal plain situated between the Seekoei and Geelhoutboom Rivers south of Humansdorp. The Seekoei River, which forms the northern boundary of the farm, is incised with fairly steep north facing slopes leading down to it. The rest of the farm to the south is almost flat with a very gentle, generally south facing slope. The underlying geology of the whole farm is mudrocks of the Lower Bokkeveld Group (Ceres Subgroup). The soils are all residual soils that have formed from the weathering of these rocks, and the underlying C horizon of all soils comprises partially weathered mudrocks. A soil catena is a sequence of different soil types along a topographical transect. On this site, running north to south, the catena starts with young, minimally developed soils on relatively fresh rock (Glenrosa soil form) on the north facing slopes. Movement southwards and downwards from the flat crest corresponds with an increase in the development of clay horizons above the underlying rock and a decrease in internal drainage of the soil profile. The catena sequence of soil forms is therefore from well-drained Glenrosa to Swartland (on the well drained flat crest) to Sepane with some drainage limitations and then to Estcourt and Kroonstad on the poorly drained landscape positions to the south.

All the soils are limited by a shallow effective depth of between 15 and 30 cm, either as a result of shallow underlying rock (Glenrosa soil form), or as a result of a dense clay horizon in the subsoil (other soil forms above). All soils have a clay content of approximately 18% in the upper soil horizons and >35% in the B horizon with a fine sand grade throughout. The colour of the top soils is classified as reddish brown.

In terms of soil limitations to agricultural production, the soils are primarily limited by their shallow effective depth. Soils to the south, particularly in low lying spots, are limited by poor drainage as well. Due to these limitations, the majority of the soils are categorised as medium agricultural suitability. Those in particularly poorly drained positions are classified as low agricultural suitability.

The agricultural suitability of an area is influenced by both soil and climate parameters. Land capability is the combination of soil suitability and climate factors. On the AGIS data base (produced by the Institute of Soil, Climate and Water, of the Agricultural Research Council), the site has a land capability classification as: Marginal potential arable 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.

However, within a local context (Humansdorp and surrounds) this type of land is mostly all that is available for agriculture. It is suitable for irrigated pasture and is utilised on parts of the farm for this purpose.

## 14.7 CURRENT LAND USE AND DEVELOPMENT AT THE SITE

Broadlands farm is a farming operation over four adjacent farms with a total extent of 1,100 hectares (see Figures 14.1 and 14.2). It is both a dairy and beef cattle farm. The dairy is an intensive operation using irrigated and other established dry land pastures, generally in close proximity to the dairy in the northern part of the farm. There are two centre pivot irrigation lands and one sprinkler irrigated land. The rest of the land is used for extensive dryland grazing for beef cattle, some of it established permanent pasture and some of it veld.

Broadlands farm has a farmstead, barn and dairy plus labourers cottages. On the north eastern side of the farm there is an additional farm house, barn, one occupied labourer's cottage and two dilapidated ones.

There is a farm dam on the Seekoei River that supplies irrigation water to the farm.

There is an established access road to the farmstead and dairy from the public road to the west, and one to the additional farm house from the public road to the east, both in good condition.

Land use and infrastructure are shown in the site plan.

## 14.8 STATUS OF THE LAND

The land is generally in good condition. However the north facing slopes are susceptible to erosion and there are several places in which recent erosion has occurred. The area experienced very heavy rain immediately prior to the field investigation. Many spots in the southern part of the farm had standing water. In terms of vegetation, the entire site is disturbed agricultural land, some with established pastures and others where no establishment has been done for a number of years and a variety of plants now grow. There is bush in the river valley on the northern boundary of the farm.

## 14.9 POSSIBLE LAND USE OPTIONS FOR THE SITE

The land is not suited to the cultivation of crops, other than pastures. The more suitable areas in terms of slope and drainage are suited to irrigated pastures, and so this should be the land use of choice. The only land use option for areas not suited to irrigated pastures is dry land grazing.

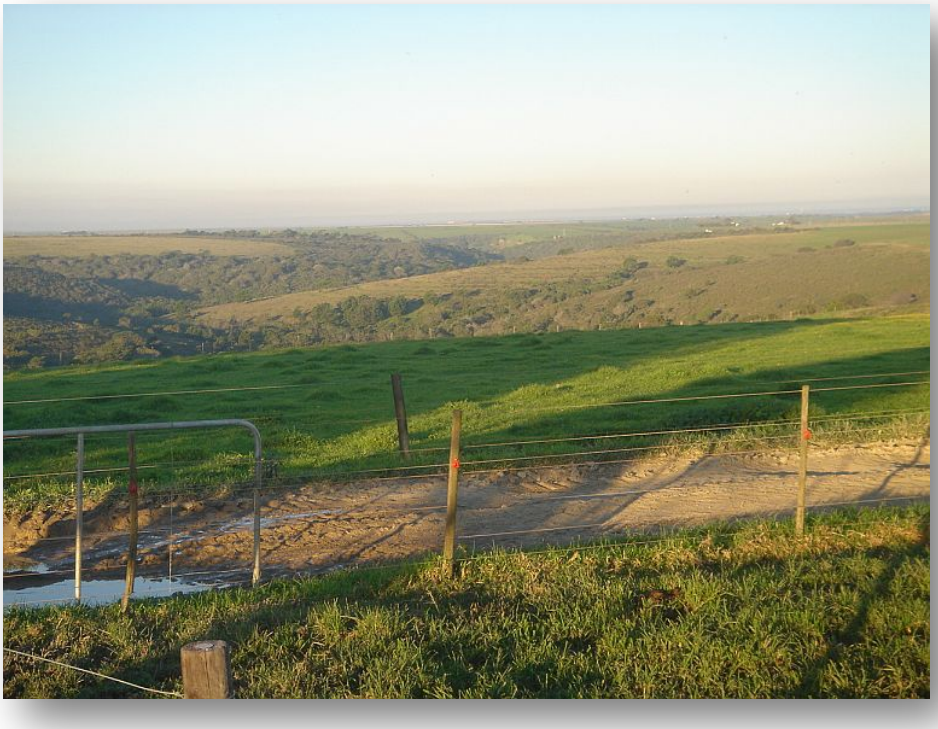

**Figure 14.4: View of Seekoei River valley in the north of the farm, looking eastwards from the farmstead.**

**Figure 14.5: Typical Glenrosa soil profile.**

**Figure 14.6: Typical Swartland soil profile.**

**Figure 14.7: Erosion at sample point 11 showing shallow underlying rock of Glenrosa soil form.**

**Figure 14.8: Typical Sepane soil profile, from sample point 1.**

**Figure 14.9: Typical landscape of the southern part of the farm - view looking north west from around soil sample point 1.**

## 14.10 IMPACTS OF THE WIND FARM DEVELOPMENT ON AGRICULTURE

The following impacts on agricultural resources and productivity are identified and discussed:

### *14.10.1 Loss of agricultural land*

The footprints of turbines, new roads, and other infrastructures will be lost as agricultural land for the duration of the project, until after completion of the decommissioning phase. The calculated footprint of the wind farm is given in Table 14.1. All new roads are shown on the site plan. There will also be a temporary loss of approximately 15,000 $m^2$ of additional land, during the construction phase, that will be used for a lay down area and a contractor's site compound.

***Mitigation***:

1. The wind farm utilises existing roads wherever possible and so the length of required new roads, and loss of agricultural land as a result, is minimised (see site plan in Figure 14.2).
2. The values in Table 14.1 are worst case scenarios. In all likelihood some of these areas can be reduced, depending on the specifics of the construction. This will further reduce the loss of agricultural land.

***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 (13.02 ha, representing only 1.1 % of the farm), that the land lost is only of medium to low soil suitability, that none of the lost land is irrigation land, and that the current agricultural activities can be continued with very minimal disturbance.

**Table 14.1: Calculation of wind farming footprint.**

| | length (m) | width (m) | Area ($m^2$) | number | Area (ha) |
|---|---|---|---|---|---|
| New roads | 9,910 | 5 | 49,550 | 1 | 4.96 |
| Hard standing for crane | 50 | 40 | 2,000 | 27 | 5.40 |
| Turbine foundations | 20 | 20 | 400 | 27 | 1.08 |
| Sub station | 120 | 90 | 10,800 | 1 | 1.08 |
| Operation & maintenance building | | | 5,000 | 1 | 0.50 |
| | | | | **TOTAL** | **13.02** |
| Total farm size: | | | | | 1,138 |
| Footprint as % of total farm: | | | | | 1.14% |
| Footprint per turbine (ha): | | | | | 0.48 |

### *14.10.2 Disturbance of run-off and resultant potential impact on erosion*

The construction of hard surfaces including hard standing for cranes, and roads can increase surface run-off and potentially lead to erosion, especially on slopes.

***Mitigation***:

1. Water run-off from all constructed and altered surfaces including roads, where slopes pose an erosion hazard, will be managed with an appropriate system to divert or channel any collected run-off water into existing natural or constructed waterways. An effective run-off management plan is a specific requirement of the Environmental Management Plan. As part of this, erosion will be monitored and corrective action will be implemented to the run-off plan in the event of any erosion problems.
2. The layout of turbines and hard standings for cranes has been done on positions of minimum slope (see site plan).
3. No new roads are proposed on slopes where erosion is a potential hazard (see site plan).
4. The values in Table 14.1 are worst case scenarios. In all likelihood some of these areas can be reduced, depending on the specifics of the construction. This will reduce run-off from these.

***Significance***: This impact is considered to be of low significance with mitigation because the entire development is on relatively flat land, and water run-off can fairly easily be controlled by the run-off control systems that will be put into place and monitored for effectiveness against erosion, as part of the EMP.

### *14.10.3 Disturbance of existing contour banks*

The construction of turbine footprints, roads and other infrastructures can disturb existing contour banks. In terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) altering of any soil conservation structures such as contour banks requires written consent from the executive officer.

***Mitigation***:

1. None of the wind farm development occurs on land that has contour banks. The only contour banks on the farm occur on the north facing slopes, north of the wind farm development.

***Significance***: This impact will not occur.

### *14.10.4 Soil profile disturbance and resultant decrease in soil agricultural capability*

Excavations for any construction and related activities (eg. burying of cables) will disturb the soil profile. If topsoil becomes buried or subsoil or other material (eg road surfacing), that is less suitable for root growth, remains at the surface, the agricultural suitability of the soil profile will be reduced.

***Mitigation***:

1. For all excavations and other direct disturbance of the soil surface (e.g for roads, buildings) that are to be returned to agricultural use, the upper 20 cm of the top soil will be stripped, stockpiled, and then re-spread over the surface of the backfilled excavation or disturbed surface, during rehabilitation.
2. The wind farm utilises existing roads wherever possible and so the length of required new roads, and disturbance to agricultural soil as a result, is minimised (see site plan).

***Significance***: With mitigation the impact is low, as the agricultural suitability of the disturbed soil profile can be restored.

### *14.10.5 Prevention of crop spraying by aircraft over land occupied by turbines*

Due to the height of the turbines, and the movement of the blades, crop spraying by aircraft, while turbines are in operation, can be hampered. However, crop spraying by aeroplane is not utilised in the current farming operation.

***Mitigation***

1. If crop spraying by aircraft is ever required, the wind farm undertakes to lock all necessary turbines (with 1 day's notice) with the blades parked in parallel to facilitate easy access for aeroplanes between them. Crop spraying by aeroplane is usually done when there is little or no wind.
2. The distance between turbines facilitates easy access for aeroplanes between them.

***Significance***: This impact is considered to be of low significance because crop spraying can still take place effectively if it is ever needed.

### *14.10.6 Disturbance of cultivation practices due to the division of existing camps by turbines and access roads*

The placement of turbines within existing, cultivated camps will necessitate a change to mechanised, vehicular traffic for cultivation operations within those camps. Previous traffic flows will need to be adjusted to exclude the turbines and access roads. The division of camps will not effect any irrigation operations as none of the impacted land is irrigation land.

***Mitigation***

1. Access roads have been positioned along the boundaries between existing camps, and turbines have been positioned close to these boundaries, wherever possible, to minimise the disturbance to vehicular cultivation operations within the camps (see site plan). Some minor changes to the positioning of the road that access the following turbines will prevent them cutting across fields, and instead locate them predominantly on the boundaries between fields: turbine numbers 01, 06, 13, 14, 16, and 23.
2. Most turbines and new access roads are positioned on non cultivated, grazing land, where mechanised vehicular traffic is not required for cultivation.

***Significance***: This impact is considered to be of low significance as required adjustments to vehicular traffic flows within camps are minimal (due to the positioning of turbines).

### *14.10.7 Placement of spoil material generated from excavations*

The excavation of turbine foundations will generate spoil material whose storage can impact on agricultural land.

***Mitigation***

1. Excavated spoil material will be backfilled into borrow pits, or if it is suitable, used for road surfacing, wherever possible.

***Significance***: This impact is considered to be of low significance as no excess of spoil material is expected.

### *14.10.8 Yield reduction*

The only factor causing yield reductions will be section 10.1 above: loss of agricultural land. All other disturbances identified above are not expected to lead to any yield reduction.

***Mitigation***: (same as point 1, above)

1. The wind farm utilises existing roads wherever possible and so the length of required new roads, and loss of agricultural land as a result, is minimised (see site plan).
2. The values in Table 14.1 are worst case scenarios. In all likelihood some of these areas can be reduced, depending on the specifics of the construction. This will further reduce the loss of agricultural land.

***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 (13.02 ha, representing only 1.1 % of the farm).

### *14.10.9 Prevention of possible future agricultural activities on land occupied by turbines*

It is possible that some potential future agricultural activities may be prevented by the existence of the wind farm, but it is highly unlikely under the existing natural agricultural resource base (climate, water and soil), and the fact that most farming can co-exist effectively with a wind farm. Centre pivot irrigation can be developed between the wind turbines, if more of it is required.

***Mitigation***:

1. WKN Windcurrent is committed to enabling the landowner to use the property for sustainable agriculture and as such will not limit usage of the area. In the event that an activity would interfere with the free flowing of the wind to the turbine, the landowner and WKN Windcurrent would need to come to an agreement as to the exact location of such activities.

***Significance***: This impact is considered to be of low significance because it is unlikely that any viable agricultural activities will be prevented by the existence of the wind farm.

### *14.10.10 Reversibility of impacts and irreplaceability of resource loss*

All the impacts on agriculture are considered to have high reversibility because most of the land utilised by the wind farm can be returned to agriculture after closure with very little remaining impact. Furthermore, the land that is impacted is only of medium to low agricultural soil suitability. A small proportion of land will be minimally and irreversibly impacted by concrete foundations, and some impact of compaction for hard standing areas may remain. Impacts on agriculture are also considered to have low irreplaceability of resource loss because only a very small proportion of land will potentially be irreplaceably lost to agriculture, as a result of any of the impacts, and again it is a loss of only medium to low agricultural soil suitability.

### *14.10.11 Cumulative impacts*

There is a cumulative impact on Broadlands farm considering that there are proposals for both a wind energy facility and a solar power facility on the farm. The cumulative impact is that agricultural land will be lost as a result of both projects. The cumulative loss of land is 13.02 hectares for the wind energy facility plus 11 hectares for the solar project giving a total loss of 24.02 hectares from a total for the whole farm of 1138hectares. This loss represents 2.1 percent of the total farming operation.

The cumulative impact is considered to be of low significance given that the area of land that will be lost to agriculture is still small, that the land lost is only of medium to low soil suitability and less suitable than other parts of the farm for intensive pasture use or irrigation, that none of the lost land is irrigation land, and that the current agricultural activities can be continued in conjunction with both projects, with very minimal disturbance.

## 14.11 ROAD MAINTENANCE AND REHABILITATION PLAN

The vast majority of roads used for construction and operation are already existing farm roads (see site plans). These will require upgrading. A limited length of new access roads will be constructed to turbines (see site plans). All roads will be gravel and will be maintained in terms of gravel surfacing. Erosion control will be managed on roads where necessary (e.g on slopes) by having drainage systems to control and direct run-off water into existing natural or constructed waterways. All roads that were newly constructed for the project will be rehabilitated back to agricultural land after decommissioning. Rehabilitation will involve mechanical ripping to relieve compaction and covering with topsoil. All roads that were already existing farm roads will remain in place after decommissioning.

## 14.12 CONCLUSIONS

An overview investigation of soil conditions and agricultural capability at the site of the wind energy project proposed near Humansdorp by WKN Windcurrent 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, and shallow auger holes were also used. This soil investigation methodology was considered completely adequate to gain a sufficiently accurate assessment of the agricultural soil capability across the site.

The soils are all residual soils that have formed from the weathering of underlying Bokkeveld mudrocks, and the underlying C horizon of all soils comprises partially weathered mudrocks. The soil catena (sequence of different soil types along a topographical transect) on this site, running north to south, is from well-drained Glenrosa (on the north facing slopes) to Swartland (on the well drained flat crest) to Sepane with some drainage limitations and then to Estcourt and Kroonstad on the poorly drained landscape positions to the south.

In terms of soil limitations to agricultural production, the soils are primarily limited by their shallow effective depth. Soils to the south, particularly in low lying spots, are limited by poor drainage as well. Due to these limitations, the majority of the soils are categorised as medium agricultural suitability. Those in particularly poorly drained positions are classified as low agricultural suitability.

Impacts on agricultural resources and productivity were identified as:

1. Loss of agricultural land
2. Disturbance of run-off and resultant potential impact on erosion
3. Disturbance of existing contour banks
4. Soil profile disturbance and resultant decrease in soil agricultural capability
5. Prevention of crop spraying by aircraft over land occupied by turbines
6. Disturbance of cultivation practices due to the division of existing camps by turbines and access roads
7. Placement of spoil material generated from excavations
8. Yield reduction
9. Prevention of possible future agricultural activities on land occupied by turbines

A number of mitigation measures have been implemented to significantly mitigate the impacts of the wind farm development on agricultural resources and productivity. These are listed in the report. The most significant of these involve the layout of the wind farm, which has been done to minimise various agricultural impacts. After mitigation, the loss of agricultural land was determined as only 13.02 hectares, which represents a mere 1.1 % of the land surface of the farm. All the identified impacts on agricultural resources and productivity were considered to be of low significance after mitigation.

In conclusion, because all impacts are considered to be of low significance after mitigation, the proposed wind energy project poses a low level of disturbance to current or likely future agricultural productivity.

# Appendix 14.1. Soil data from all investigated sample profiles on the site. All sample positions are shown on the site plan, and numbers in this table correspond to those in the site plan. Top soil refers to the A horizon and sub soil to the B horizon.

| No | Form & family | Effective depth (depth to limiting horizon) (cm) | Type of limiting horizon | Sand grade & clay % | | Slope | Soil suitability category | Sample type | GPS co-ordinates Lat/Lon hddd.ddddd° |
|---|---|---|---|---|---|---|---|---|---|
| | | | | top soil | sub soil | | | | |
| 1 | Sepane 2110 | 20 | clay | fi, 18 | fi, 40 | 1 | medium | cutting | S34.08402 E24.79835 |
| 2 | Estcourt 1100 | 25 | clay | fi, 18 | fi, 40 | 1 | medium/low | auger | S34.07921 E24.79359 |
| 3 | Estcourt 1100 | 20 | clay | fi, 18 | fi, 40 | 1 | medium/low | auger | S34.08354 E24.78654 |
| 4 | Kroonstad 1000 | 30 | clay | fi, 18 | fi, 40 | 1 | medium/low | cutting | S34.07660 E24.79740 |
| 5 | Swartland 2211 | 20 | clay | fi, 18 | fi, 40 | 3 | medium | cutting | S34.07231 E24.79866 |
| 6 | Swartland 2211 | 20 | clay | fi, 18 | fi, 40 | 3 | medium | cutting | S34.06823 E24.80119 |
| 7 | Glenrosa 1211 | 25 | rock | fi, 18 | fi, 20 | 6 | medium | cutting | S34.06643 E24.80143 |
| 8 | Glenrosa 1211 | 25 | rock | fi, 18 | fi, 20 | 7 | medium | cutting | S34.06431 E24.80106 |
| 9 | Glenrosa 1211 | 30 | rock | fi, 18 | fi, 20 | 8 | medium | auger | S34.06508 E24.79576 |
| 10 | Glenrosa 1211 | 20 | rock | fi, 18 | fi, 20 | 8 | medium | auger | S34.06402 E24.79591 |
| 11 | Glenrosa 1211 | 20 | rock | fi, 18 | fi, 20 | 7 | medium | erosion | S34.06385 E24.79348 |
| 12 | Glenrosa 1211 | 30 | rock | fi, 18 | fi, 20 | 5 | medium | auger | S34.06238 E24.78589 |
| 13 | Glenrosa 1211 | 15 | rock | fi, 18 | fi, 20 | 11 | medium | auger | S34.06069 E24.78630 |
| 14 | Glenrosa 1211 | 20 | rock | fi, 18 | fi, 20 | 11 | medium | auger | S34.05949 E24.78588 |
| 15 | Swartland 2211 | 30 | clay | fi, 18 | fi, 40 | 2 | medium | auger | S34.06873 E24.78102 |
| 16 | Glenrosa 1211 | 20 | rock | fi, 18 | fi, 20 | 4 | medium | erosion | S34.06349 E24.76752 |
| 17 | Estcourt 1100 | 25 | clay | fi, 18 | fi, 40 | 2 | medium | auger | S34.07026 E24.76180 |
| 18 | Swartland 2211 | 30 | clay | fi, 18 | fi, 40 | 10 | medium | cutting | S34.06019 E24.75925 |
| 19 | Glenrosa 1211 | 20 | rock | fi, 18 | fi, 20 | 12 | medium | cutting | S34.05909 E24.75926 |
| 20 | Kroonstad 1000 | 20 | clay | fi, 18 | fi, 40 | 1 | medium/low | auger | S34.07124 E24.74706 |
| 21 | Kroonstad 1000 | 20 | clay | fi, 18 | fi, 40 | 1 | medium/low | auger | S34.07732 E24.74654 |

*Notes: 1. Profile 6 is on the transition between Swartland and Glenrosa soil forms.*