

REPORT

On contract research for

SAVANNAH ENVIRONMENTAL



SOIL INFORMATION FOR PROPOSED TSITSIKAMMA WIND ENERGY FACILITY, EASTERN CAPE

By

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DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist and that I am independent of any of the parties involved and that I have compiled an impartial report, based solely on all the information available.

A square box containing a handwritten signature in black ink. The signature is stylized and appears to be 'D G Paterson'.

D G Paterson

March 2011

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental to undertake a soil investigation in the Tsitsikamma area, in the Eastern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact assessment (EIA) process for the proposed Tsitsikamma wind energy facility. The objectives of the study are;

- To obtain all existing soil information and to produce a soil map of the specified area, as well as
- To assess broad agricultural potential.

2. SITE CHARACTERISTICS

2.1 Location

The area that was investigated lies to the south of the N2 national road and to the east of the Tsitsikamma River as it flows into the Indian Ocean. The area lies between 34° 02' and 34° 09' S and between 24° 27' and 24° 36' E and the location is shown in Figure 1.

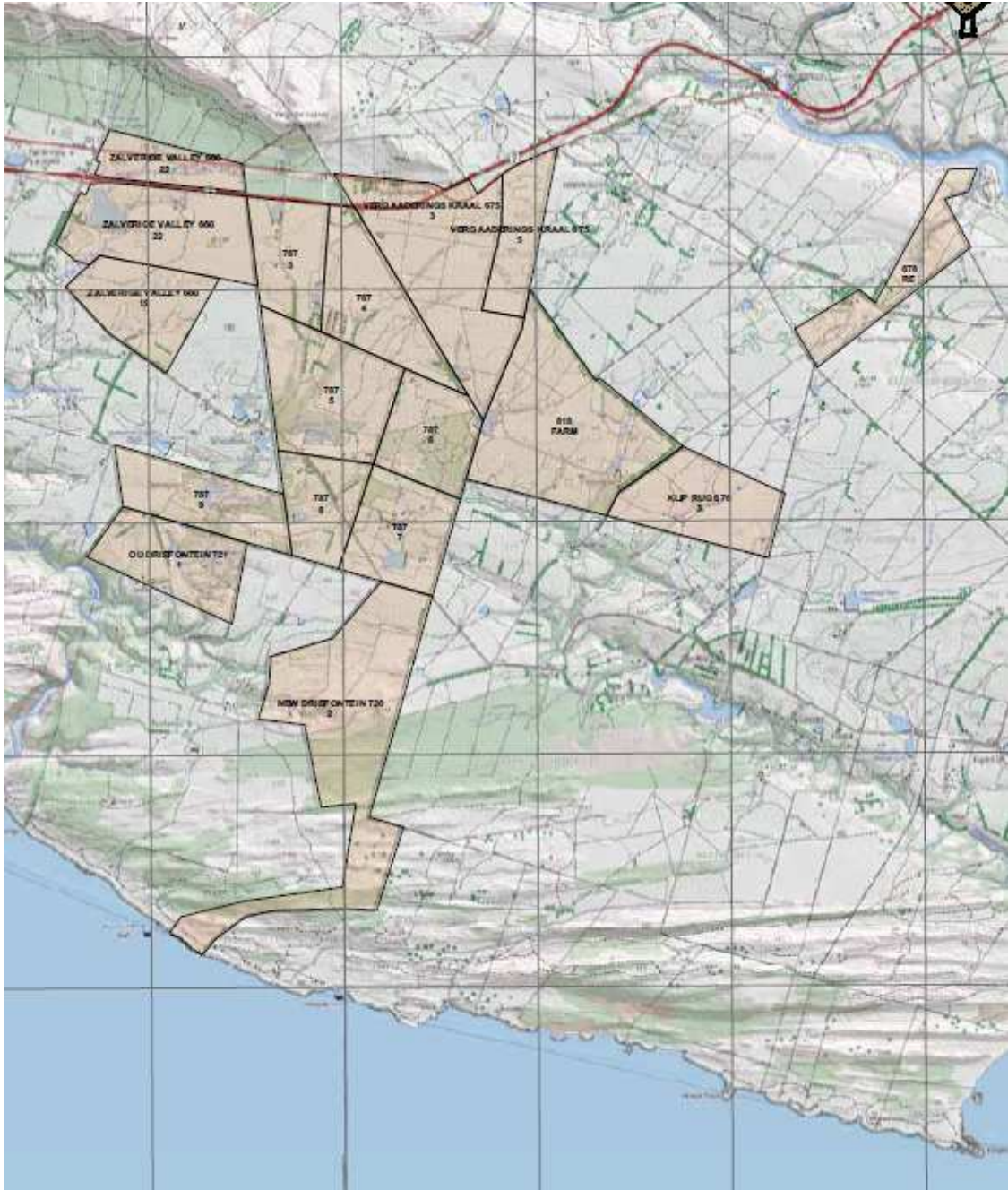


Figure 1 Locality map

2.2 Terrain

The study area consists of gently undulating topography, with slopes mostly between 2% and 8%. The altitude of most of the area is between 100 and 220 m although the southern extremity reaches the coast.

2.3 Climate

The climate of the area has an all-year-round rainfall distribution, with an annual average of 580 mm (Koch, 2003).

The main climatic indicators are shown below.

Table 1 Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)	Average frost dates
Jan	60.0	15.4	24.2	Start date: End date: Days with frost:
Feb	53.1	16.1	25.0	
Mar	64.7	15.7	24.6	
Apr	72.5	13.7	23.1	
May	99.5	11.7	20.8	
Jun	75.4	10.2	18.5	
Jul	98.4	9.7	18.1	
Aug	97.2	9.7	18.7	Heat units (hrs > 10°C) Summer (Oct-Mar): 1618.9 Winter (Apr-Sept): 965.3
Sep	92.8	10.4	18.8	
Oct	88.4	11.4	20.3	
Nov	79.4	13.4	22.3	
Dec	60.3	14.8	23.8	
Year	941.3 mm	17.1°C (Average)		

2.3 Parent Material

The area is underlain mostly by quartzite and sandstone of the Peninsula Formation, Table Mountain Group, with aeolianite of the Nananga Formation in the south (Geological Survey, 1990).

3. METHODOLOGY

Existing soil information was obtained from the map sheet 3324 Port Elizabeth (Oosthuizen *et al.*, 2003) from the national Land Type Survey, published at 1:250 000 scale. A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al.* (1977).

The areas under investigation are covered by the following land types, as shown on the map in the Appendix, namely:

Bb75 (Yellow-brown, structureless, highly weathered plinthic soils)

Ca78, Ca79, Ca80, Ca81 (Red and yellow, structureless plinthic soils, also with clayey duplex soils)

Ha47, Ha49, Ha50 (Deep, grey sandy soils)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground truthed.**

4. SOILS

A summary of the dominant soil characteristics of each land type for the study area is given in Table 1 below.

Column 6 shows the distribution of ***dryland*** agricultural potential within the land type (see Section 5), with the dominant class shown in **bold**.

Table 1 Land types occurring (with soils in order of dominance) in the study area.

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Bb75	Rock	-	23%		High: 7.3 Mod: 61.3 Low: 31.4
	Constantia 10/11	>1200	20%	Deep, grey to yellow, sandy soils	
Ca78	Kroonstad 13/14/16	600-900	46%	Greyish brown, loamy, structureless soils on gleyed clay	High: 18.6 Mod: 79.1 Low: 2.3
	Glencoe 26	600-1100	36%	Yellow-brown, loamy soils on mottled soft plinthite	
Ca79	Kroonstad 16	600-900	24%	Greyish brown, loamy, structureless soils on gleyed clay	High: 1.0 Mod: 53.0 Low: 46.0
	Cartref 12	400-500	19%	Grey-brown, loamy, gravelly soil on weathering rock	
Ca80	Kroonstad 13/14/16	700-900	50%	Greyish brown, loamy, structureless soils on gleyed clay	High: 0.0 Mod: 95.5 Low: 4.5
	Longlands 10/11/22	700-800	13%	Grey, sandy/loamy soils on mottled soft plinthite	
Ca81	Longlands 22 + Westleigh 13	100-400	38%	Grey-brown, loamy topsoils on brown to grey, gravelly loamy subsoils on mottled soft plinthite/cemented ferricrete	High: 3.5 Mod: 10.3 Low: 86.2
	Kroonstad 16	400-600	14%	Grey-brown, loamy topsoils on grey, loamy subsoils on clay	
Ha47	Fernwood 30/31	800-1200	45%	Deep, grey, sandy soils	High: 11.0 Mod: 85.5 Low: 3.5
	Constantia 10/11	>1200	35%	Deep, grey to yellow, sandy soils	
Ha49	Dunes (Fernwood)	>1200	96%	Deep, grey, coastal sand dunes	High: 0.0 Mod: 3.8 Low: 96.2
	Clovelly 40/41	>1200	4%	Yellow-brown, sandy structureless soils	
Ha50	Constantia 10/11/21	>1200	41%	Deep, grey to yellow, sandy soils	High: 4.3 Mod: 41.8 Low: 53.9
	Dunes (Fernwood)	>1200	42%	Deep, grey, coastal sand dunes	

5. AGRICULTURAL POTENTIAL

Much of the study area consists of land type **Ca80** (which is dominated by moderately deep grey soils, often overlying a clay subsoil, of moderate potential) in the north, with land type **Ha47** (dominated by deep, grey and yellow sands of moderate potential) to the south, with the dunes of land type **Ha49** adjacent to the coast.

The long-term annual average rainfall in the area (Section 2.3) means that there is significant potential for arable agriculture in the area although the sandy soils may be prone to drought conditions. The shallower soils are suited for grazing at best. The grazing capacity of the area is moderate, around 6-10 ha/large stock unit (ARC-ISCW, 2004).

On the Google Earth image of the area, extensive areas of cultivation are observed, including several centre-pivot irrigation lands throughout the northern half. This might pose a problem for siting of turbines and other infrastructure, as, according to the prevailing legislation, all currently irrigated land is deemed to be of high potential and will be subject to protection.

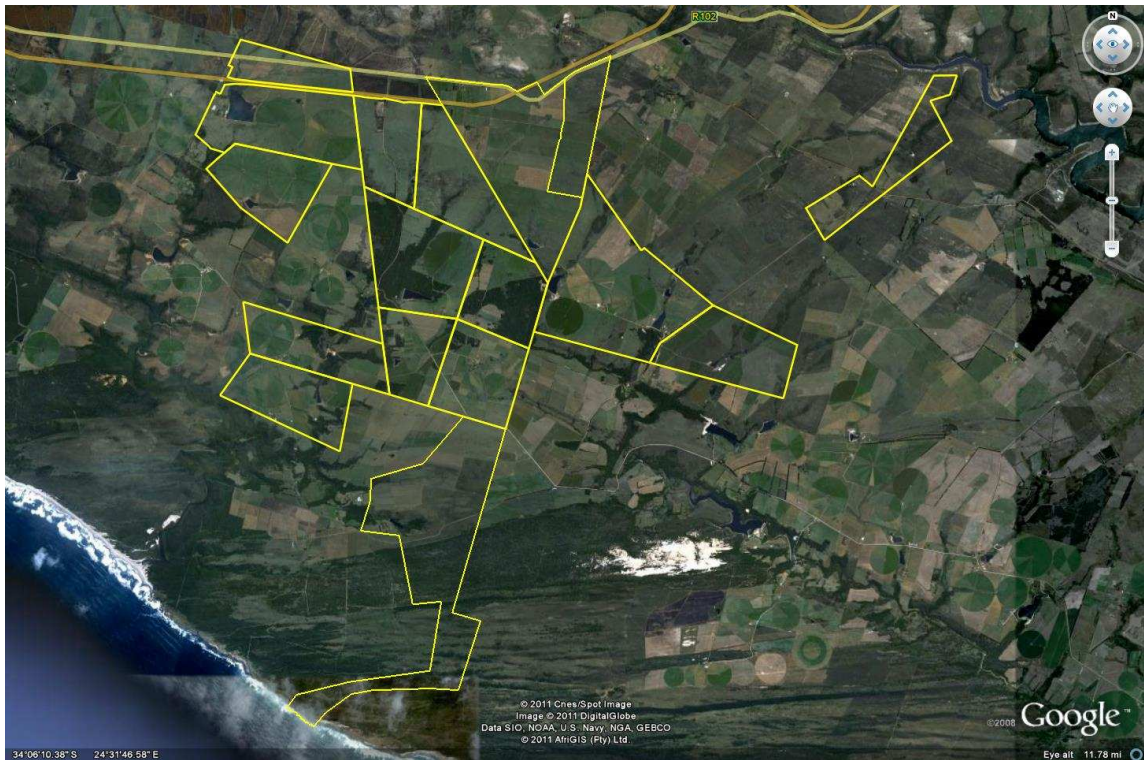


Figure 2 Google Earth image of survey area

6. IMPACTS

The major impact on the natural resources of the study area would be the loss of potentially agricultural land due to the construction of the turbines and associated infrastructure. However, this impact would only be of significance if either high potential or irrigated land were to be affected. If such areas are avoided, the fact that the turbines will be placed far apart would mean that cultivation and/or grazing would still be possible between the structures.

The obvious areas for the development of the project would be the dune areas in the south, where agricultural soils are scarce.

The impact can be summarized as follows:

Table 2 Impact significance

Nature of impact	Loss of agricultural land	Land that is no longer able to be utilized due to construction of infrastructure
Extent of impact	Site only	Confined to areas within the site where turbines (5 x 5 m), substation (80 x 100 m), buildings and access roads etc will be located
Duration of impact	Long-term	Will cease if operation of activity ceases
Probability of impact	Highly probable	
Severity of impact	Moderately severe	
Significance of impact	High (possibly low with mitigation – see below)	Mainly due to mixed soil potential and existing irrigated areas, as well as scattered/random nature of infrastructure which allows for many of the agricultural activities to continue on the land.
Mitigation factors	The main mitigation would be to ensure that as much as possible of the planned infrastructure be confined to non-agricultural land, or use is made of existing roads etc. In addition, the infrastructure could be dismantled at a future stage to return the environment to approximately its original state.	

6.1 Recommendations

Due to the occurrence of irrigated area throughout much of the area, it is possible that a more detailed investigation will be required.

However, it is recommended that any infrastructure be confined as far as possible to the southern dune areas (generally within the south of **Ha47** and within the **Ha49** land types as shown on the map). If this is done, then probably a more detailed soil study would not be necessary.

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APPENDIX

MAP OF LAND TYPES

