

REPORT

On contract research for

Savannah Environmental (Pty) Ltd

TSHWANE STRENGTHENING PROJECT PHASE 1

VOLUME 1:

SOILS AND AGRICULTURAL POTENTIAL FOR PROPOSED APOLLO-VERWOERDBURG TRANSMISSION LINE AND SUBSTATION EXTENSION, NEAR IRENE

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental (Pty) Ltd to undertake an investigation of the soils and associated agricultural potential for a transmission line from the proposed extension to the existing Verwoerdburg substation southward to the existing Apollo-Pluto transmission line, near Irene in Gauteng Province. The objectives of the study are;

- To classify the soils and to produce a soil map of the specified area as well as
- To assess the broad agricultural potential.

Three different routes were proposed, namely Alternative 1 (denoted by the red dotted line), farthest west, and Alternative 2 (denoted by the green dotted line), and Alternative 3/3A (denoted by the orange/yellow dotted line), which is the farthest east (see Appendix).

2. SITE CHARACTERISTICS

2.1 Location

The proposed site for the extension to the Verwoerdburg substation lies to the west of the R21 Highway, south-east of Irene. The terrain is undulating, with slopes of around 2-4%, and altitude is around 1 550 m above sea level.

2.2 Climate

The climate of the area can be regarded as typical of the Highveld, with cool to cold, dry winters and warm, moist summers (Koch, 1984). The main climatic indicators are given in Table 1.

Table 1. Climate Data

Month	Average Rainfall (mm)	Average Min. Temp (°C)	Average Max. Temp (°C)	Average frost dates
Jan	118.8	13.8	27.0	Start date: 13/5 End date: 13/9 Days with frost: ± 115
Feb	93.3	13.1	26.3	
Mar	79.3	11.6	24.9	
Apr	39.6	7.6	23.0	
May	19.7	3.0	20.3	
Jun	6.8	-0.7	17.7	
Jul	8.8	-0.8	17.5	
Aug	8.4	1.8	20.6	Summer (Oct-Mar): 1 719 Winter (Apr-Sept): 305
Sep	22.1	6.1	23.6	
Oct	64.1	10.4	26.0	
Nov	109.1	11.9	25.9	
Dec	110.2	13.2	26.8	
Year	680.2 mm	15.4 °C (Average)		

The long-term average annual rainfall is 680.2 mm, of which 574.9 mm, or 84.5%, falls from October to March. Temperatures vary from an average monthly maximum and minimum of 27.0°C and 13.8°C for January to 17.5°C and -0.8°C for July respectively. The extreme high temperature that has been recorded is 38.9°C and the extreme low -13.3°C. Frost occurs every year on approximately 115 days on average between May and September.

2.3 Parent Material

The parent material of the area comprises of dolomite and chert of the Malmani Subgroup, Chuniespoort Group (Geological Survey, 1978).

3. METHODOLOGY

The area was covered by existing soil maps, at 1:50 000 scale, of the PWV peri-urban soil survey (Yager, 1990). The soils were classified (MacVicar *et al*, 1977) and similar soils were grouped into map units. This information was digitised in ArcGIS and each soil map unit was allocated a class of broad agricultural potential (Section 5). No fieldwork was carried out.

The soil boundaries are shown on the map in the Appendix.

4. SOILS

In the immediate vicinity of the proposed alternatives, most of the soils are shallow (<400 mm) on rock, with much surface rock outcropping. Alternative 1 crosses a narrow band of deeper soils, close to the Olifantsspruit stream.

Further to the south and south-west, deeper, red soils occur, while to the east, zones of moderately deep, red and yellow-brown soils are found.

Each of the mapping units from the PWV survey was allocated to a class of broad agricultural potential, mainly using a combination of depth, texture, soil form and rockiness. The results of this exercise are shown in Table 2 below and the colours used correspond to the colours used in the map in the Appendix.

Table 2 Agricultural Potential

Agricultural Potential Class	Soil Mapping Units	Effective Depth (mm)
HIGH	Deep to moderately deep Hutton & Avalon soils; no or few physical limitations	600-1200
MODERATE	Moderately deep or variable depth soils; limited depth and occasionally heavy texture	300-1200
LOW	Shallow, gravelly soils, often with some rock; severe depth limitation	<600
ROCKY	Significant rock outcropping (>40%), usually shallow soils with severe depth limitation	<300
WET AREAS	Low-lying areas, soils prone to seasonal waterlogging or flooding	<300
WASTE	Industrial waste areas, such as mine dumps or slimes dams etc	-
URBAN	Housing, industrial, mining, commercial areas etc; not surveyed	-

5. AGRICULTURAL POTENTIAL

Transmission Line

From the map, it can be seen that the dominant class of broad agricultural potential is low, except for the narrow band of higher potential soils close to the stream, on Alternative 1.

For this reason, in comparing the alternatives, it would seem that the most suitable route would be either Alternative 2 or Alternative 3/3A, where all of the soils are shallow and rocky, with a low agricultural potential.

Extension to Sub-station

All the soils around the Verwoerdburg sub-station are shallow and/or rocky, and have a low potential for arable agriculture. There is thus no limitation to the expansion of the substation as far as soils and agricultural potential is concerned.

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APPENDIX:

SOIL MAP

Apollo - Verwoerdburg: Agricultural Potential

Legend

Alternatives

- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 3a

AGRIC POTENTIAL

- High
- Moderate
- Low
- Rocky areas
- Wet soils
- Urban areas
- Waste areas

