REPORT

On contract research for
SSI

ARC • LNR

SOILS AND AGRICULTURAL POTENTIAL FOR THE PROPOSED P166 ROAD, NEAR MBOMBELA, MPUMALANGA PROVINCE

By

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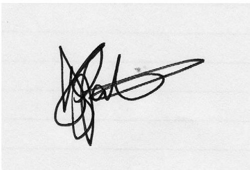
Declaration:

I declare that the author of this study is a qualified, registered natural scientist (soil science), is independent of any of the parties involved and has no other conflicting interests.



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1 INTRODUCTION AND BACKGROUND

The ARC-Institute for Soil, Climate and Water was requested by SSI to carry out a study regarding the proposed P166, just west of Mbombela (Nelspruit), northward towards White River.

The aim of the report is to obtain all available data on the soils occurring, as well as their properties, characteristics and agricultural potential

2 STUDY AREA

The study area extends from approximately 5 km south of the town of Mbombela, on the western side, crossing the Crocodile River and extending northward towards White River. The proposed route and the location are shown in Figure 1, with the main proposed route in black, and some shorter alternative stretches in pink. There is a single deviation in the south, at Maggiesdal, with three alternatives in the north, at Phumulani.

2.1 Terrain

The terrain of the area is moderately undulating, with slopes of around 2-5% closer to the Crocodile River which become steeper (10-30%) in certain parts, especially in the south and closer to White River. The altitude varies from around 700 m above sea level at the river to over 900 m above sea level at the highest points.

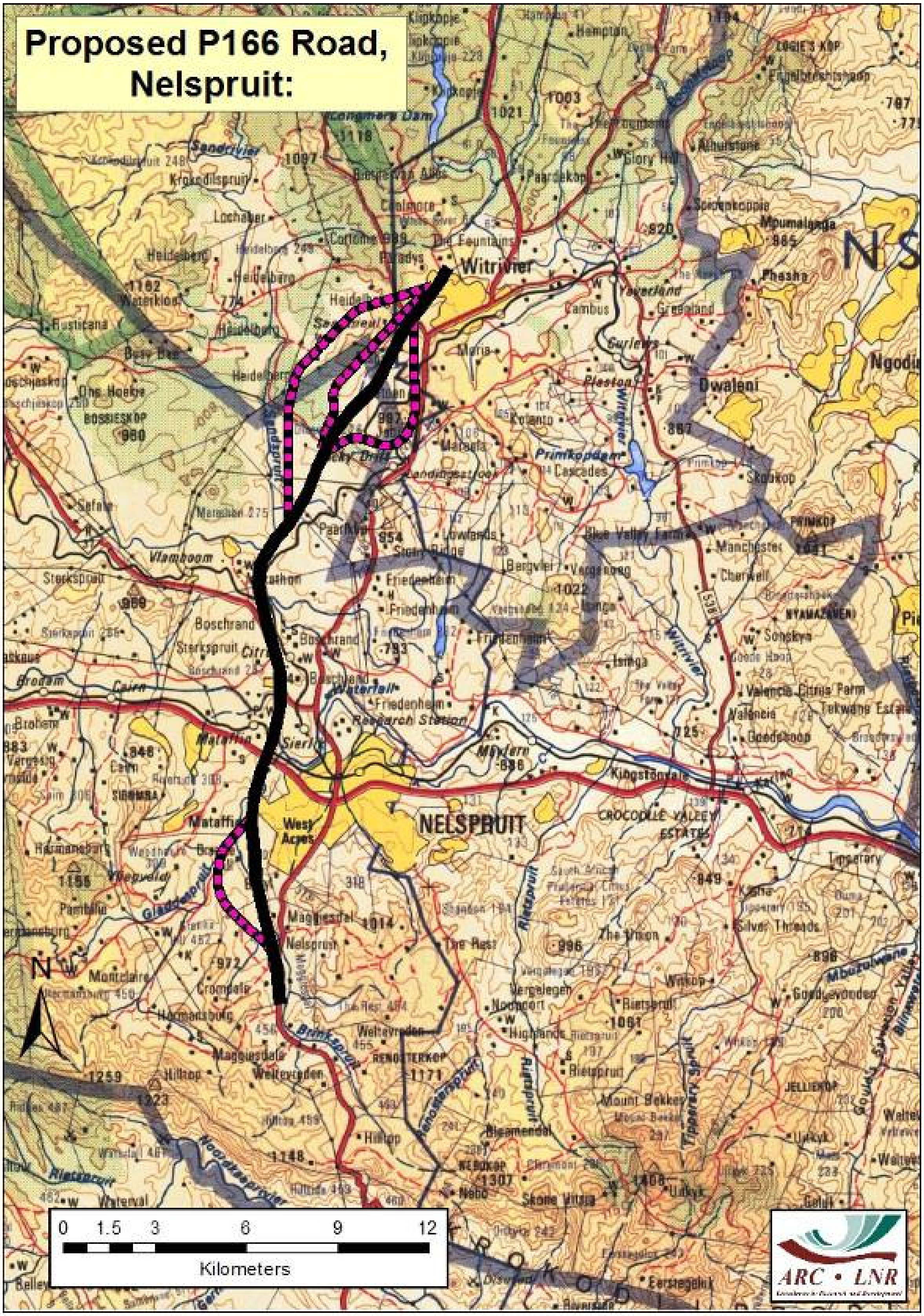

Figure 1 Locality map

2.2 Climate

Climate data was obtained from the national Land Type Survey (Koch & Schoeman, 1989).

The climate of the area can be described as typical of the southern Lowveld, with warm to hot, moist to wet summers and dry, mild to cool winters. The main climatic parameters are given in Table 1.

On average, 695.3 mm, or 83% of the annual average rainfall of 836.3 mm falls in the summer growing season (October to March).
Frost is extremely rare. The extreme maximum temperature is 41.7°C and the extreme minimum –2.0°C

Table 1 Climate data for Amersfoort area

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)	Average frost dates
Jan	152.5	18.6	29.1	Start date:
Feb	121.3	18.5	29.0	End date:
Mar	103.4	17.4	28.2	Days with frost:
Apr	57.4	14.4	26.8	
May	17.6	10.0	25.1	
Jun	12.3	6.5	23.1	
Jul	12.2	6.4	23.3	**Heat units (hrs > 10°C)**
Aug	10.4	8.7	24.9	Summer
Sep	31.1	11.7	26.7	(Oct-Mar): 2338
Oct	69.8	14.7	27.2	
Nov	111.7	16.7	27.6	Winter
Dec	136.6	17.6	28.5	(Apr-Sept): 1371
Year	**836.3 mm**	**20.0°C (Average)**		

2.3 Geology

The area is underlain mainly by gneiss and migmatite of the Nelspruit Granite Suite (Geological Survey, 1986).

3 METHODOLOGY

The soil information that was used to compile this study, forms part of the map sheet 2530 Barberton of the national 1:250 000 land type survey (Schoeman *et al*, 1984). Each land type mapping unit is a unique combination of soil pattern, terrain and macroclimate.

The information contained in the land type survey is of a reconnaissance nature (scale of 1:250 000) and, as such can only represent the dominant soils within a specific land type. It is to be expected that areas of different soils will occur, but due to the nature and scale of the survey, their distribution can not be delineated in detail.

Within the study area, three land types occur, namely:

Ab42, Ab43 (Red, structureless, highly weathered soils)
Ba67 (Red, structureless, highly weathered soils, some with underlying plinthite)

The distribution of these land types is shown in the map in Appendix 1.

4 SOILS

The main characteristics of each of the land types are given in Table 2 below. The soils were classified according to MacVicar *et al*, 1977), with the dominant agricultural potential class within each land type indicated in **bold type**.

Note:
The column in Table 2 that refers to “Agricultural Potential” refers to the **dryland** potential only: that is the soil characteristics without any climatic parameters.

Table 2 Soil properties per land type

Land type	Dominant soils	Sub-dominant soils	Slopes	Agricultural Potential (%)
Ab42	Hu16/17; 600-1200 mm; SaCl-Cl 53%	Hu18; 900-1200 mm; Cl 12% Rock & shallow soils 10%	10-30%	**H: 75.7** M: 11.2 L: 13.1
Ab43	Hu16/17; 900-1200 mm; SaCl-Cl 54%	Hu18; 900-1200 mm; Cl 31%	8-20%	**H: 92.0** M: 1.5 **L: 6.5**
Ba67	Rock & shallow soils 31%	Hu25/26/35/36; 900-1200 mm; SaLm-SaClLm 27%	2-5%	**H: 42.0** M: 24.0 L: 34.0

5 AGRICULTURAL POTENTIAL

From the map in Appendix 1, it can be seen that the proposed route (black line), along with most of the various alternatives, runs mainly through land type **Ab42**, and crosses land type **Ba67** in the vicinity of the Crocodile River.

The soils of the two land types are similar, with **Ba67** containing a higher percentage of shallow soils, but both land types are dominated by red, moderately deep to deep, medium- to heavy-textured soils of the Hutton form, which are generally very favourable for cultivation, despite the high clay content (35-55%) in places within **Ab42**.

The main limiting factor is actually terrain. Land type **Ba67** occurs in the footslopes and river plain area of the Crocodile River, where cultivation is relatively easy on the flatter slopes. This is evidenced by the extensive citrus, sugar cane and other cultivation along the river. Land type **Ab42**, on the other hand, especially closer to the Marathon substation, has significantly steeper slopes, up to 30% in places, so that cultivation is difficult, if not impossible. Large parts of the eastern Mpumalanga escarpment have similar soils and terrain, and the only possible land use is forestry.

5.1 Alternatives

The various proposed alternatives do not involve significantly different soils or terrain than the main proposed route. Table 2 indicates that within land types Ab42 and Ab43, most of the soils occurring can be regarded as high potential soils (75% and 92% respectively), so that the alternative routes will not traverse significantly different soil patterns, only terrain.

However, Phumulani Alternative 1 (the most northwesterly alternative close to White River) traverses areas under cultivation, possibly including irrigated citrus (this needs to be ground-truthed). Therefore, this alternative is the least recommended.

5.2 Erodibility

The soils in the area, due largely to their kaolinitic mineralogy, are inherently stable soils not prone to erosion. Only if soils on the steeper slopes are disturbed and not rehabilitated will serious soil erosion occur.

6 IMPACTS AND RECOMMENDATIONS

6.1 Impacts

With the construction of a road, the main impact will be the loss of agricultural soil.
This is summarized in Table 3.

The type of farming practiced within the study area will in all probability be a mixture of arable production (on the deeper, more productive soils) and livestock grazing. Within the wider landscape as a whole, a road will not have a significant impact if areas of irrigation are avoided as far as possible.

Table 3 Impact significance

Nature of impact	***Loss of agricultural land (land that is no longer able to be utilized due to construction)***
	Pre-mitigation
Extent (E) of impact	Footprint (1)
Duration (D) Of impact	Long-term (4)
Intensity (I) Of impact	Low to medium (4)
Probability (P) of impact	Possible (2)
Significance of impact (S+D+I) x P	Low (1+4+4) x 3 = **27**
Mitigation measures	Ensure that as few cultivated areas as possible are affected by construction, and that irrigated areas are avoided.
Significance after mitigation	**Low**

6.2 Fatal Flaws and Sensitivity Screening

There are **no fatal flaws** regarding the study area. However, there are a number of sensitive areas that should be taken into, namely irrigated areas. These occur on or adjacent to the footslope zone,close to the Crocodile River, as well as to the west of White River, where terrain restrictions do not preclude cultivation.

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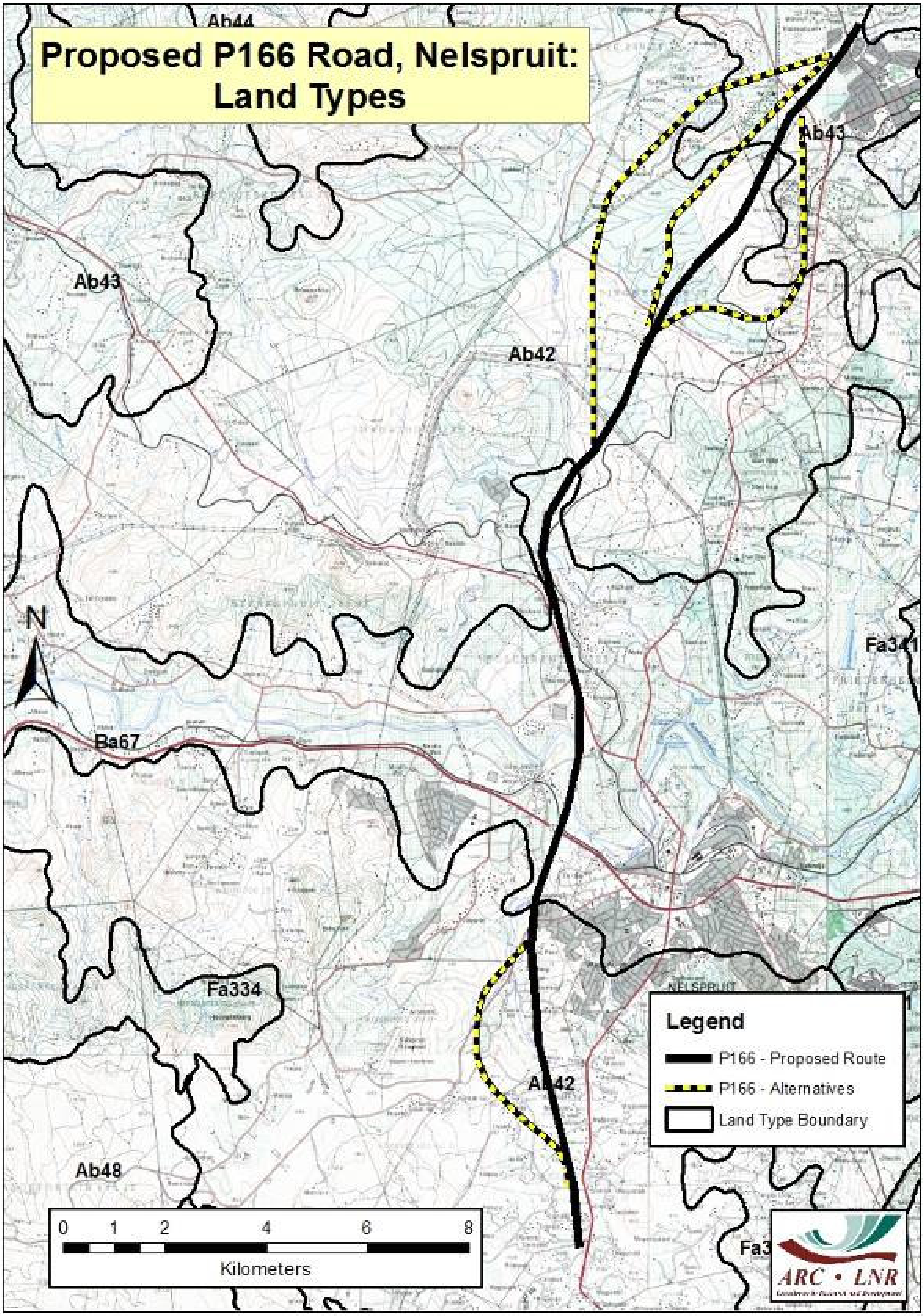
APPENDIX 1:

Distribution of Land Types



Proposed P166 Road, Nelspruit:
Land Types
Ab44
Ab43
Ab43
Ab42
Fa341
Ba67
Fa334
Ab42
Ab48
NELSPRUIT
Legend
P166 - Proposed Route
P166 - Alternatives
Land Type Boundary
N
0 1 2 4 6 8
Kilometers
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