ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED MATIMBA-WITKOP NO. 2 400 kV TRANSMISSION LINE, NORTHERN PROVINCE

SPECIALIST STUDY – AGRICULTURAL POTENTIAL

APPENDIX L

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1. METHODOLOGY

The soil information which was used to compile this study forms part of the Ellisras and Pietersburg maps of the national 1:250 000 land type survey (Botha, 1993; Paterson & Haarhoff, 1985).

2. LAND TYPES WITHIN THE STUDY AREA

Each land type is a unique combination of soil pattern, terrain and macroclimate. The study area crosses a total of 34 land types, namely:

- Ab91 (red, structureless leached soils)
- Ac160 (red and yellow, structureless leached soils)
- Ac253 (red and yellow, structureless leached soils)
- Ae225 (red, structureless unleached soils)
- Ae227 (red, structureless unleached soils)
- Ae289 (red, structureless unleached soils)
- Ae290 (red, structureless unleached soils)
- Ae334 (red, structureless unleached soils)
- Ae335 (red, structureless unleached soils)
- Ah28 (red and yellow, structureless unleached soils)
- Bb116 (yellow, structureless leached soils with plinthite)
- Bc44 (red, structureless unleached soils with plinthite)
- Bc45 (red, structureless unleached soils with plinthite)
- Bc46 (red, structureless unleached soils with plinthite)
- Bd57 (yellow, structureless unleached soils with plinthite)
- Ca117 (plinthic soils with clays)
- Ea208 (black, swelling clays)
- Fa295 (shallow, non-calcareous soils)
- Fa296 (shallow, non-calcareous soils)
- Fa531 (shallow, non-calcareous soils)
- Fa533 (shallow, non-calcareous soils)
- Fa758 (shallow, non-calcareous soils)
- Fa760 (shallow, non-calcareous soils)
- Fb349 (shallow, non-calcareous and calcareous soils)
- Fb437 (shallow, non-calcareous and calcareous soils)

- Fc478 (shallow, calcareous soils)
- Fc732 (shallow, calcareous soils)
- Ia109 (deep, alluvial soils)
- Ia130 (deep, alluvial soils)
- Ia131 (deep, alluvial soils)
- Ib293 (rocky area)
- Ib307 (rocky area)
- Ib351 (rocky area)
- Ib447 (rocky area)

Figure 1 indicates land type boundaries (single solid lines) in relation to the proposed Transmission line corridors (double dashed lines).

2.1. Land Type Characteristics

The main characteristics of each of the land types within the study area are provided in Table 1 below. The soils were classified according to MacVicar *et al*, 1977).

Table 1: Soil properties per land type

Land type	Dominant soils	Sub-dominant soils		Slopes	Agricultural Potential (%)
Ab91	Hu/Cv24/25 400-1000 mm, LmSa 39%	Ms/Gs 100-400 mm, LmSa 22%		2-8%	H: 11,1 M: 46,3 L: 42,6
Ac160	Hu/Cv24/25 600-1200 mm, LmSa 60%	Cv26 500-1200 mm SaLm 31%		<2%	H: 31,9 M: 62,8 L: 5,3
Ac253	Cv/Hu24-26 400-900 mm, SaLm-SaClLm 42%	Rock + 27%	Gs14/13 100-500 mm, LmSa 17%	1-5%	H: 5,3 M: 49,3 L: 45,4
Ae225	Hu26/36 400-1200 mm, SaClLm 39%	Hu27/37 600-1200 mm, SaCl-Cl 29%		2-6%	H: 50,3 M: 41,7 L: 8,0
Ae227	Hu34/36 400-1100 mm, LmSa-SaLm 39%	Gs14/15 + 150-350 mm, LmSa 18%	Cv35/36 400-1200 mm, LmSa-SaLm 11%	2-5%	H: 5,0 M: 57,6 L: 37,4

Land type	**Dominant soils**	Sub-dominant soils	**Slopes**	**Agricultural Potential (%)**
Ae289	Hu36 400-1200 mm, SaClLm 49%	Hu/Cv35 400-100 mm, LmSa-SaLm 16%	<3%	H: 14,5 M: 73,9 L: 11,6
Ae290	Hu34-46 100-1200 mm, LmSa-SaClLm 48%	Cv24-46 400-1200 mm, LmSa-SaClLm 16%	<3%	H: 1,5 M: 81,2 L: 16,7
Ae334	Hu34/35 >1200 mm, Sa-LmSa 68%	Hu34/35 400-600 mm, Sa-LmSa 15%	<3%	H: 2,5 M: 90,5 L: 7,0
Ae335	Hu34/35 >1200 mm, Sa-LmSa 38%	Hu34-36 400-600 mm, Sa-LmSa 30%	<5%	H: 46,8 M: 29,5 L: 23,7
Ah28	Hu35/36 300-1000 mm, LmSa-saClLm 25%	Rock 24% + Cv32/35 400-100 mm, Sa-LmSa 18%	4-20%	H: 2,1 M: 46,5 L: 51,4
Bb116	Av25/26 700-1000 mm, LmSa-SaClLm 26%	Cv25/26 700-1200 mm, LmSa-SaClLm 25%	<3%	H: 14,0 M: 36,5 L: 49,5
Bc44	Hu35 >1200 mm, Sa-LmSa 56%	Av34-36 800-1200 mm, LmSa-SaLm 14%	<2%	H: 12,4 M: 84,8 L: 2,8
Bc45	Hu36 800-1200 mm, SaClLm 48%	Hu24/5-34/5 500-1200 mm, LmSa-SaLm 18%	<3%	H: 60,3 M: 29,1 L: 10,6
Bc46	Hu22/5-32/5 800-1200 mm, Sa-LmSa 35%	Cv35/Av35 1000-1200 mm, LmSa-SaLm 22%	1-8%	H: 0 M: 65,6 L: 34,4
Bd57	Ms10/Gs14 100-400 mm, LmSa-SaLm 41%	Cv/Hu26/36 400-1000 mm, SaLm-Lm 29%	<3%	H: 5,8 M: 43,6 L: 50,6
Ca117	Cv/Hu35/36 600-900 mm, LmSa-SaLm 24%	Sw30/Mw10 450-600 mm, SaClLm-SaCl 21% + Gs26/Av26 500-750 mm, SaClLm 21%	1-10%	H: 0 M: 24,0 L: 76,0

Land type	Dominant soils	Sub-dominant soils		Slopes	Agricultural Potential (%)
Ea208	Ar10/20 >900 mm, Cl 46%	Sw31/Mw21 400-700 mm, SaClLm-SaCl 22%		1-5%	H: 0 M: 46,0 L: 54,0
Fa295	Ms10/11 50-150 mm, LmSa-SaLm 34%	Hu/Cv36 + 200-800 mm, LmSa-SaLm 19%	Gs15/18 300-450 mm, LmSa-SaLm 19%	<2%	H: 1,6 M: 26,9 L: 71,5
Fa296	Ms10/Gs15 50-450 mm, Sa-LmSa 46%	Hu/Cv25/35 150-400 mm, Sa-LmSa 35%		<3% (70% of area)	H: 0 M: 0 L: 100,0
Fa531	Ms10/Gs14-18 100-300 mm, LmSa-SaLm 39%	Rock 28%		40- 100% (70% of area)	H: 0 M: 7,0 L: 93,0
Fa533	Ms10/Gs14-18 100-300 mm, LmSa-SaLm 47%	Rock 23%		20- 120% (70% of area)	H: 0 M: 0 L: 100,0
Fa758	Rock 43%	Hu/Cv34-36 200-400 mm, LmSa-SaLm 27%		5-50%	H: 0 M: 13,5 L: 86,5
Fa760		Gs15/17 + 100-250 mm, LmSa-SaLm 32%	Rock 32%	20- 100%	H: 0 M: 20,0 L: 98,0
Fb349	Ms20/22 50-200 mm, LmSa-SaLm 41%	Oa36/46 500-1000 mm, SaLm-SaClLm 20%		2-8%	H: 0 M: 48,2 L: 51,8
Fb437	Oa16/36 800-1200 mm, SaLm-Lm 26%	Hu/Cv24/25 + 400-1200 mm, LmSa-SaLm 21%	Ms10/Gs15 100-300 mm, LmSa-SaLm 16%	1-6%	H: 28,7 M: 33,1 L: 38,2
Fc478	Ms10/12 100-300 mm, Sa-LmSa 42%	Gs14/24/15/25 + 100-400 mm, Sa-LmSa 18%	Rock 15%	1-5%	H: 14,3 M: 8,3 L: 77,4
Fc732	Oa46/45 >900 mm, SaLm-Lm 22%	Cv45/46 + 400-700 mm, SaLm-SiLm 20%	Va40/41 >1200 mm, SaClLm-Cl 18%	1-4%	H: 22,0 M: 53,0 L: 25,0

Land type	Dominant soils	Sub-dominant soils	Slopes	Agricultural Potential (%)
Ia109	Oa33/43 >1200 mm, Sa-LmSa 33%	Oa46/47 >1200 mm, SaClLm-SaCl 30%	<2%	H: 74,4 M: 7,8 L: 17,8
Ia130	Oa16/36 >900 mm, SaClLm 30%	Hu36/Cv36 500-900 mm, LmSa-SaLm 28%	1-5%	H: 48,0 M: 44,0 L: 8,0
Ia131	Oa16/36 >900 mm, SaClLm 30%	Hu36/Cv36 500-900 mm, LmSa-SaLm 28%	1-5%	H: 48,0 M: 44,0 L: 8,0
Ib293	Rock 63%	Ms10 100-250 mm, LmSa-SaLm 14%	4-30%	H: 3,5 M: 2,0 L: 94,5
Ib307	Rock 65%	Ms10/Gs15 20-100 mm, Sa-SaLm 13%	2-50%	H: 0 M: 20,1 L: 79,9
Ib351	Rock 64%	Ms10/Gs15-18 100-250 mm, LmSa-SaLm 18%	5-100%	H: 4,0 M: 0 L: 96,0
Ib447	Rock 65%	Hu34/35 200-450 mm, LmSa-SaLm 15%	1-100%	H: 0 M: 10,0 L: 90,0

From the above table, it can be seen that generally the land types with a higher agricultural potential are those containing higher proportions of red and/or yellow soils (e.g. Ae225, Ae335, Bc45), as well as the alluvial areas (Ia109, Ia130, Ia131). However, there are some land types with a mixture of soils of varying potential, the best of which are Fb437 and Fc732. The land types with mainly rock and shallow soils (the remaining Fa, Fb and Fc land types, as well as the Ib land types) have a low agricultural potential and usually have significantly steeper slopes throughout most of the land type.

Land type Ea208, which covers most a small part of the eastern portion of the route, consists mainly of fairly deep, black, swelling clay (turf) soils, which have a moderate agricultural potential. The mainly smectitic nature, with consequent shrinking and swelling properties, of the Arcadia (turf) soils means that there is a narrower moisture range for cultivation than other agricultural soils. If the swelling clay soils become wet, the pores fill up, they saturate easily and drain slowly, causing anaerobic conditions (especially under irrigation) and a deficit of oxygen in the root zone. If allowed to dry out, however, these soils can crack, damaging roots. Surface crusting is also a potential problem, due to the swelling and sealing nature of the soils, which can lead to increased infiltration rates. However, the black clay soils are naturally fertile, with high cation exchange capacities and high organic carbon contents. If well managed, they can be productive soils.

3. RECOMMENDATIONS

Most of the study area crosses fairly flat topography with loamy sand to sandy loam textured soils, mainly due to the underlying geology. Although isolated areas with steeper topography occur here and there, the only significant area with rock, steeper slopes and shallow soils occurs between Marken and the Magalakwena River at the northern edge of the Waterberg. There is only a small area of swelling clay (turf soils).

Although many of the land types have a significant component of high potential soils, the rainfall along the route is low, generally around 400 mm annually. This is too low for any form of dryland cultivation, and irrigation would be needed, especially as the texture along most of the route is dominantly sandy, leading to rapid infiltration. Only in the vicinity of Pietersburg, at the eastern end of the route, does the annual rainfall approach 550 mm, which is still very marginal for dryland cultivation.

The impact of a power line in this area will thus generally be low regarding dryland agricultural potential, due both to the climatic restrictions in the area (low rainfall, high temperatures) and the occasional nature of the pylons, as opposed to a continuous development, such as a road or railway.

Only where the power line route crosses major rivers (which could be a source of irrigation), such as the Mogol, Palala and Mogalakwena, could more detailed surveys possibly be required to better quantify the irrigable soils in the vicinity.

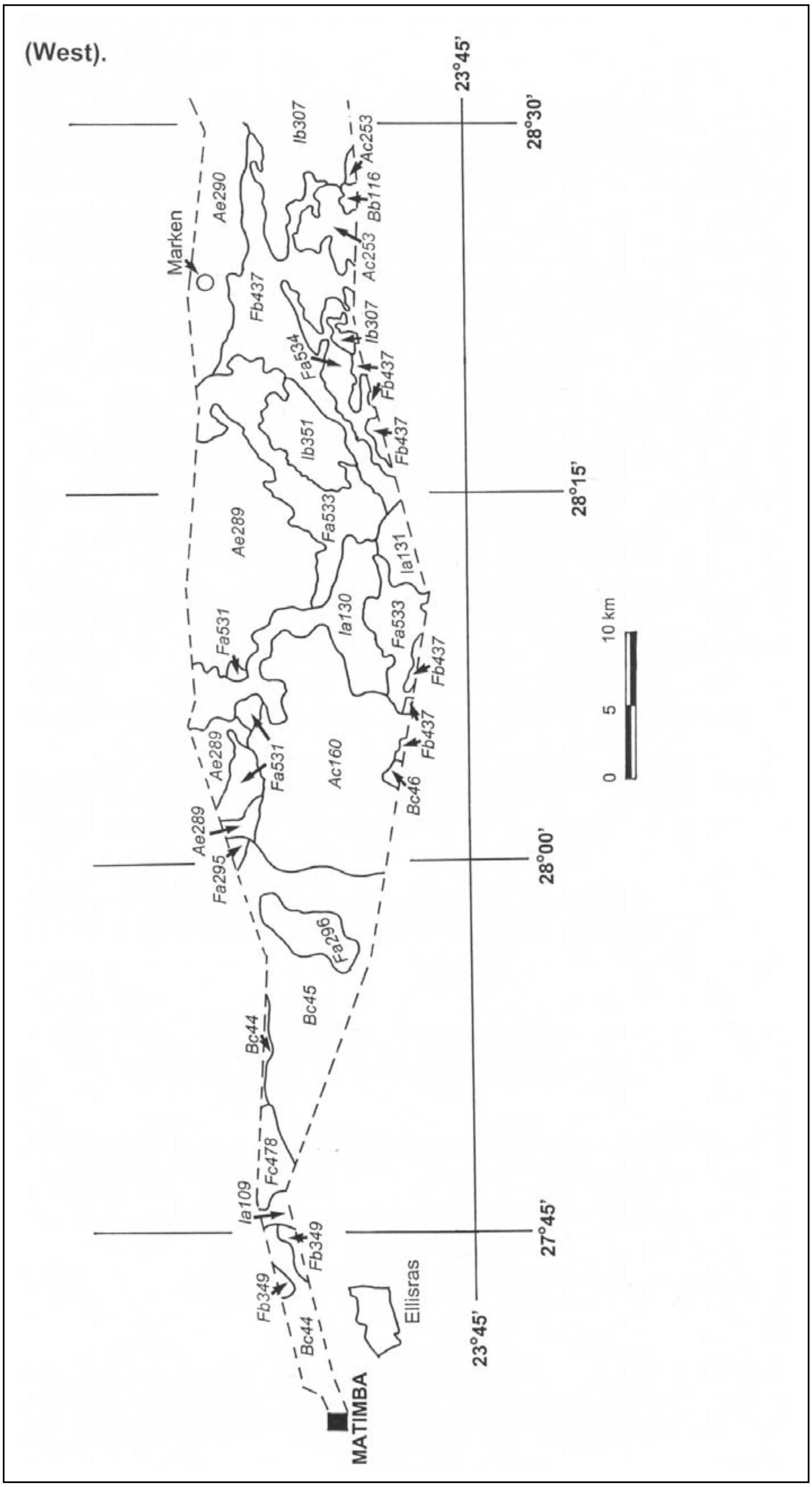

Figure 1a: Land type boundaries for western section of study area (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

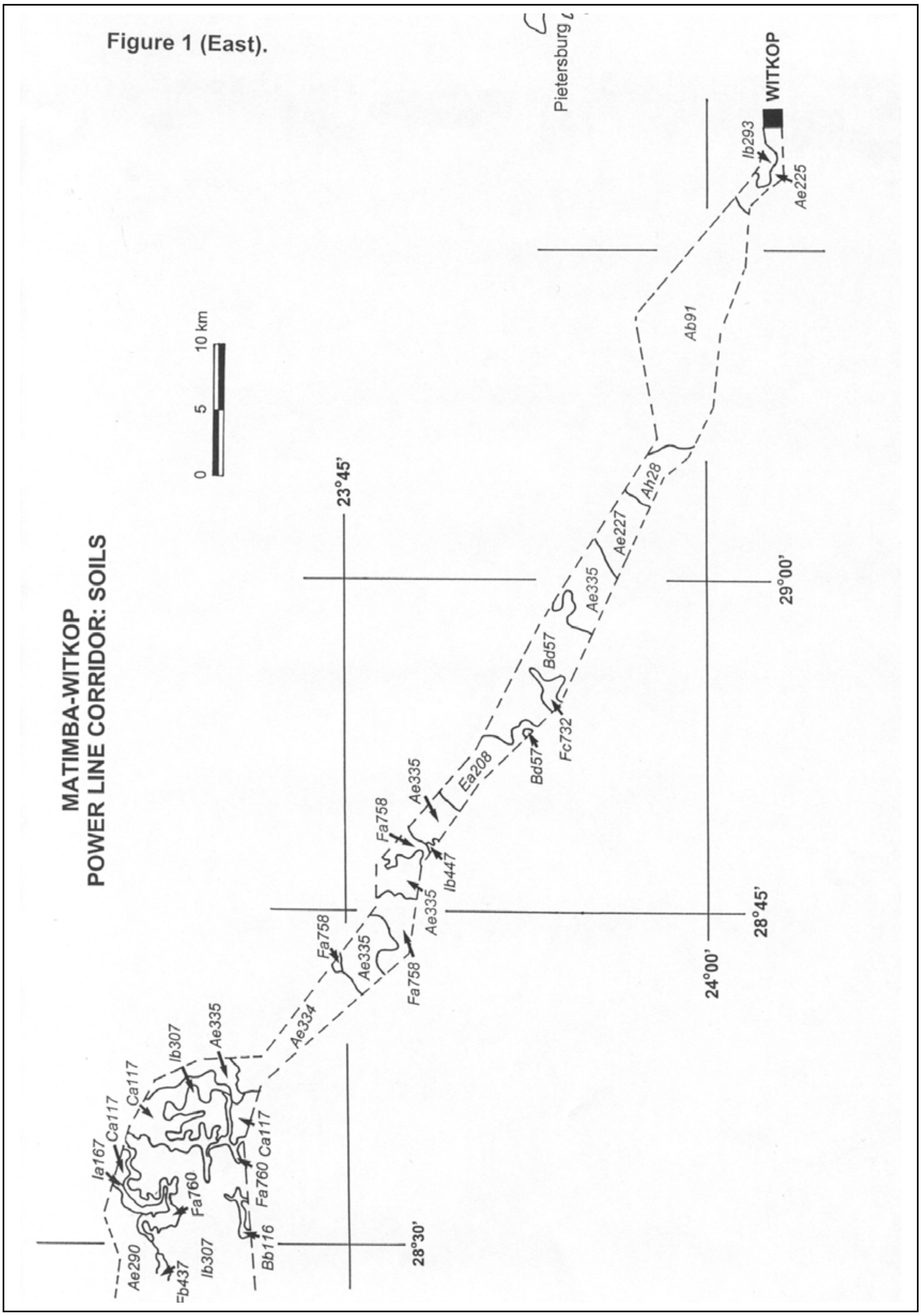

Figure 1b: Land type boundaries for eastern section of study area (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

4. REFERENCES

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