

3. OVERVIEW OF THE STUDY AREA

3.1. Location of the Study Area

The broader study area falls within the Northern Province and extends from the Matimba Powerstation in the west, includes a portion of the Waterberg Biosphere Reserve area, as well as towns such as Marken and Overysse and tribal land up to the Witkop Substation in the east, near Pietersburg. The Matimba and Witkop Substations lie approximately 250 km apart, and are separated by a varying landscape ranging from open game farming areas in the west, through the mountainous Waterberg Biosphere Reserve region, through agricultural areas in the east to the Witkop Substation.

3.2. Key Demographic Information

3.2.1. General Description of the Study Area

The key towns in the study area are Ellisras, Marken, and Pietersburg, with several scattered rural settlements scattered throughout. The Matimba Substation is situated approximately 5 km outside of Ellisras, which falls under the jurisdiction of the Lephalale Municipality. Pietersburg, situated in the central part of the Northern Province, falls under the jurisdiction of the Polokwane Municipality and is also the seat of the provincial government in the Northern Province. The Witkop Substation is situated less than 20 km to the south of Pietersburg. Marken is a small town situated approximately 70 km to the east of Ellisras and falls under the jurisdiction of the Mogalakwena Municipality.

The Waterberg Biosphere Reserve includes protected areas such as the Masebe Nature Reserve, Moepel Farms, Mokolo Dam, Keta Nature Reserve, Kwalata Game Reserve, Lapalala Wilderness and Touchstone Game Ranch area, and was formed in 2001 under the “Man and the Biosphere” (MaB) programme of UNESCO. This area has a rich diversity of plant and animal life, with several eco-tourism projects being initiated.

3.2.2. Demographic and Socio-Economic Characteristics

The economy of the Lephalale area is dominated by electricity production due to the proximity of the Matimba Powerstation, and supported by agricultural activities (game and cattle farming) and mining (Grootgeluk Coal Mine) and, therefore, provide the majority of employment opportunities in the area. The game farming and the hunting industries have

grown over the past couple of years, with numerous farmers converting from cattle farming to game farming. A similar situation exists in the Marken area, where a number of farms are geared to accommodate foreign and/or local hunters and tourists. The area between Ellisras and Marken, the Waterberg Biosphere and the Moepel Farms to the south-east of Marken has significant potential for further tourism development (especially hunting and eco-tourism activities) due to its favourable location, distance from main centres like Gauteng, the absence of malaria as well as the scenic beauty and natural diversity of this area.

The demographic data of the Lephalale area reflect a high migrant labour force between the ages of 20-29, as people in this category are employed elsewhere. The 5-19 year category, however, is the highest and this young population, therefore, results in a high dependency ratio, as this category is reliant on income earners. This generates the demand for employment, and many income earners would be required to migrate to bigger centres in search of work. The Ellisras-Marapong area has numerous schools, but there is still a definite need for additional primary schools in the area.

The majority of communities in the Pietersburg area are characterised by low employment levels, low income and high illiteracy levels, as well as relatively poor health conditions. Population growth in the area is high, especially in the urban areas surrounding Pietersburg. Economic activities in the greater Pietersburg area include mining, commerce, agriculture and manufacturing, and the tourism sector shows potential for development.

Pietersburg has various schools, business centres, post offices, libraries, health and emergency facilities, sports facilities, as well as the Gateway International Airport. The Pietersburg area also has eight tertiary institutions, the University of the North being the largest.

The prevalence of HIV/Aids in the Northern Province is estimated at 7,9% based on 1996 figures.

3.2.3. Infrastructure

A number of roads traverse the study area. The main roads serving the Ellisras and Marken areas (i.e. the western portion of the study area) include the R33, R510 and R518. Numerous gravel roads also provide access to the area. The Grootgeluk Coal Mine and Matimba Powerstation dominate the Ellisras area.

Infrastructure related facilities in Marken include the Marken Co-operation, a garage, liquor stores, butcheries and several smaller shops.

The major route to Pietersburg is the N1, with the R101, R521 and R567 serving as secondary roads. A railway line also traverses the area. The roads and airport assist in attracting numerous tourists to the greater Pietersburg municipal area as it falls within the north-south route through the Northern Province.

3.3. Land-Use Profile

The study area is characterised by agricultural land, rural settlements (residential areas) and nature conservancy areas. The primary land-uses within the western section of the study area are game farming and conservation areas, with harvesting being commonly found around smaller towns, such as Marken and Ellisras. The cultivation of table grapes also takes place adjacent to the Lephalala River in the centre of the study area. The primary land-use within the eastern section of the study area is agriculture in the form of cattle farming, maize production (usually for household purposes) and harvesting, as well as both commercial and subsistence farming. This eastern section is predominantly tribal land. The farming activities surrounding the Pietersburg area and Witkop Substation range from pig farming and cattle farming to cultivation.

The majority of the properties in the western sector of the study area are registered in the name of private owners and companies. However, most portions in the eastern sector of the study area traverse Tribal land and State-owned land. Some portions are registered in the names of Trusts and Companies, which generally implies that the properties are being used for the purposes of commercial farming.

3.4. Climate and Atmospheric Conditions

Climate data for the study area is only available from weather stations in Ellisras and Pietersburg.

3.4.1. Precipitation

The area between Ellisras and Pietersburg is best described as semi-arid, with a mean annual rainfall of 435 mm and 478 mm per annum (p.a.), respectively. Both areas are subject to a summer rainfall regime, with a high in December at Ellisras (80 mm), and November at

Pietersburg (85 mm). In contrast, only 3 mm of rain falls on average in the months of May and July at Ellisras, and July at Pietersburg.

3.4.2. Temperature

Mean annual air temperatures range from 15,0°C in June to 26,7°C in January in the Ellisras area, and from 12,2°C in June/July to 22,6°C in January in the Pietersburg area.

Average daily maxima range from 28,2°C to 38,2°C in the Ellisras area and from 24,6°C to 33,2°C in the Pietersburg area. Average daily minima range from 11,1°C to 24,2°C in the Ellisras area, and from 9,4°C to 20,2°C in the Pietersburg area (Weather Bureau, 1997).

Record highs were measured at Ellisras (40,7°C) on 11 January 1983, and at Pietersburg (36,8°C) on 24 October 1961, while record lows were measured at the former on 10 June 1988 (0,2°C) and at the latter on 28 June 1964 (-3,5°C).

3.4.3. Wind

At Pietersburg, the wind tends to blow from the east in summer and the south-west in winter (Schulze, 1965).

3.4.4. Lightning

The lightning Ground Flash Density in the study area is between 3 to 9 strikes/km²/year (refer to Figure 3.1 overleaf).

3.4.5. Extreme Events

Thunderstorm activity occurs on average 44 days a year at Pietersburg, with most activity concentrated in the summer months when it can be expected more than seven days a month during November, December and January. The least thunderstorm activity occurs in winter, with a low in July (0,4 events per month). A maximum gust of 39,4 m/s (adjusted to sea level) can be expected every 50 years at Pietersburg (Anon., 1975).

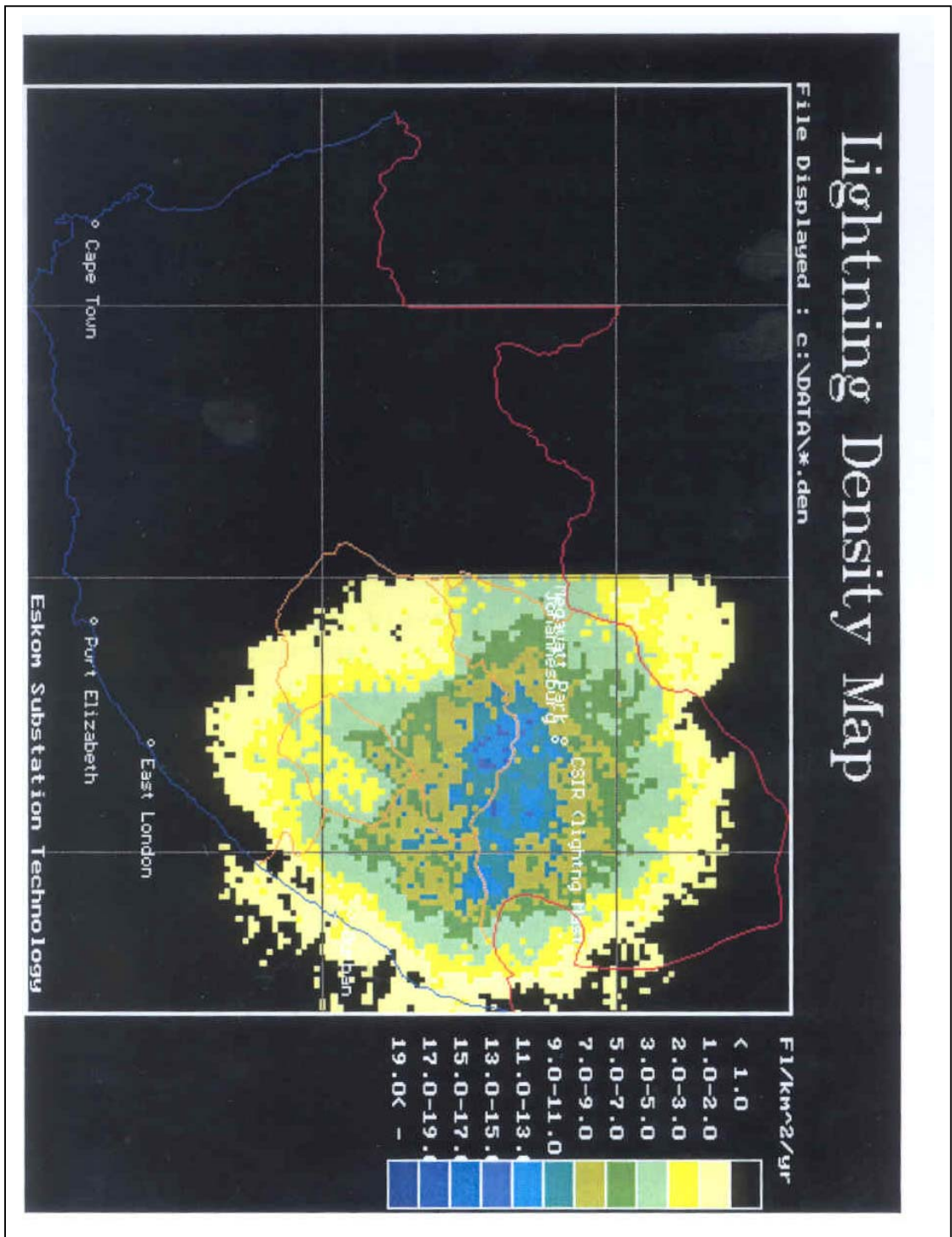


Figure 3.1: Lightning density map

3.5. Topography

The study area traverses undulating topography within the Limpopo River catchment, punctuated by isolated koppies (e.g. Tafelkoppe, Height = 1 189 m) and inselbergs (e.g. Mamothololo, Height = 1 254 m), becoming hilly in the south-east. The area between Marken and the Mogalakwena River is rugged terrain, being dominated by a band of steep rocky terrain, rising to elevations of 1 200 m amsl. This rocky range forms part of the Waterberg Biosphere Reserve and Masebe Nature Reserve areas.

Elevations range from 810 m at the confluence of the Makolo and Tambotie rivers in the west to 1 614 m in the extreme south-east of the study area.

3.6. Surface Water

Four tributaries of the Limpopo River, namely (from west to east) the Mokolo, Lephalala, Mogalakwena and Sand intersect the corridors while draining northwards towards the Limpopo River.

3.7. Geology and Soils

The Tafelkoppe and Ga-Mabula in the far west of corridor 1 are likely to owe their origins, at least in part, to resistant sediments of the Swartrand Formation (Karoo Sequence). Further east, the higher lying areas on the farm Lilie Fontein 506 LR are underlain by the sandstones and conglomerates of the Mogalakwena Formation (Waterberg Group). The same resistant units are associated with the rugged terrain west of Skrikfontein se Nek on the farms Schurwepoort 502 LR and Klip Bank 713 LR. To the south-east, Mamothololo is underlain by a diabase sill within the Nebo Granite (Lebowa Suite - Bushveld Igneous Complex). The extreme south-eastern segment of corridor 1 and the surrounding area is underlain by the Hout River Gneiss, Mashashane Suite (Lunsklip and Uitloop granites), Turfloop and Geyser granites, diabase dykes and metasediments and volcanics of the Pietersburg Group.

3.7.1. Mineral Deposits

A number of deposits are known from within or immediately adjacent to the study area. These include active and abandoned mines, and unworked deposits for beryllium, building sand, feldspar, gold, mica, platinum, nickel, copper, and stone aggregate.

3.7.2. Dolomitic/Limestone Areas

Dolomitic material in the form of marble is known from the Bandelierkop Complex and Gumbu Group of the Beit Bridge Complex, while the Chuniespoort Group occurs as serpentinitised dolomitic xenoliths within the Bushveld Igneous Complex (Brandl, 1986). In addition, a thin limestone unit (thickness *ca.* 300 mm) has been described from exposures near the Limpopo River from within the Wellington Formation of the Karoo Sequence (Brandl, 1996). None of these units as found within the corridors are expected to facilitate sinkhole formation.

Dolomites and limestones are largely restricted to the Duitschland Formation (Vd) and Malmani Subgroup (Vmd) of the Chuniespoort Group south of Pietersburg, neither of which underlie the study area. Both of these units are, however, present in close proximity to the south-eastern extremity of corridor 1.

3.8. Agricultural Potential

The study area crosses a total of 34 land types. The soils were classified according to MacVicar, *et al* (1977). Each land type is a unique combination of soil pattern, terrain and macroclimate. Figures 3.2a and 3.2b indicate land type boundaries (single solid lines) in relation to the proposed Transmission line corridors (double dashed lines). The main characteristics of each land type are provided in Appendix L.

In general, the land types with a higher agricultural potential are those containing higher proportions of red and/or yellow soils, as well as the alluvial areas. Some land types show a mixture of soils of varying potential. The land types with mainly rock and shallow soils have a low agricultural potential and usually have significantly steeper slopes throughout most of the land type.

Land type Ea208 (black, swelling clays), which covers a small section of the eastern portion of the study area, 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.

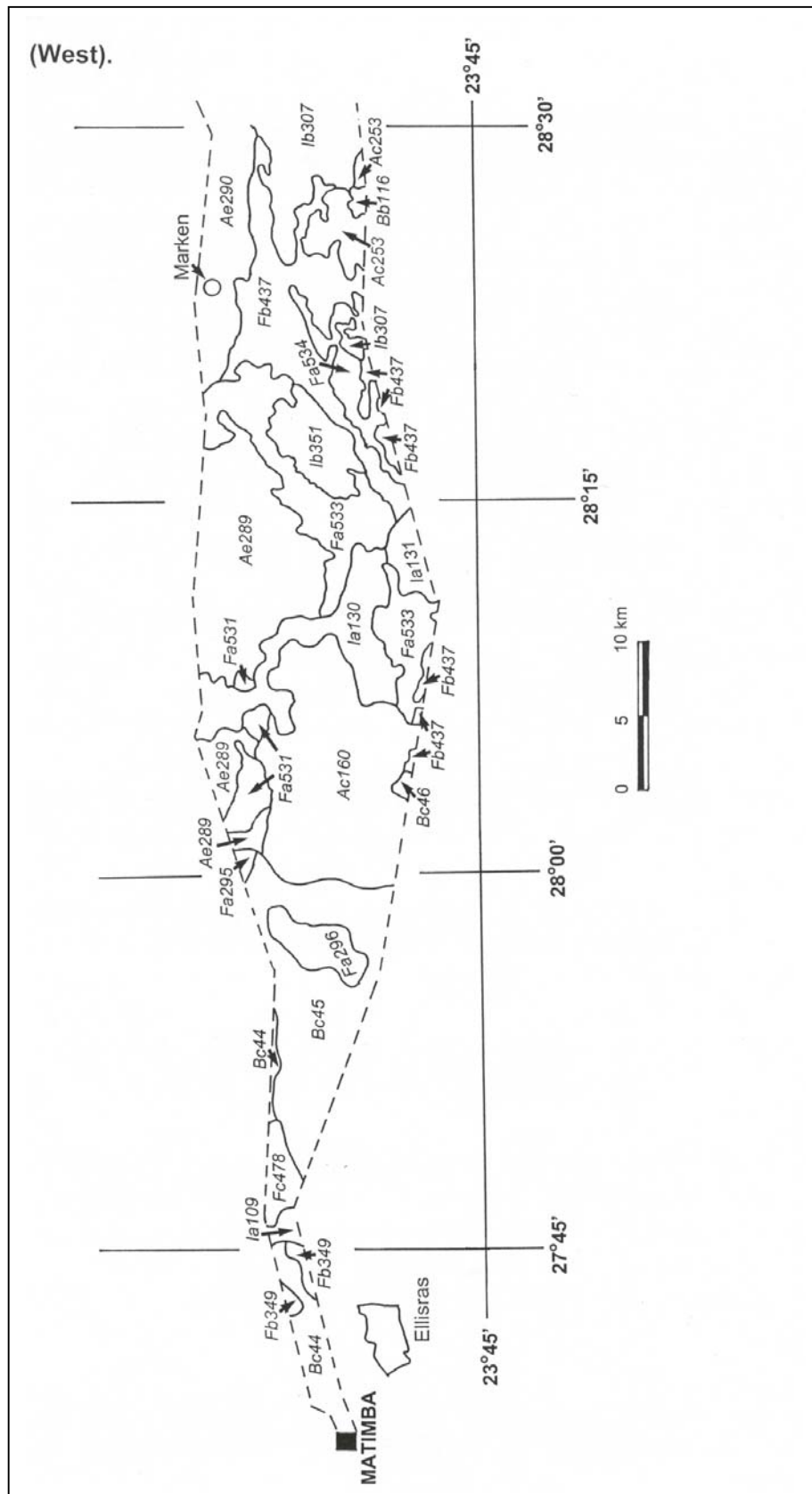


Figure 3.2a: Land type boundaries for western section of study area (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

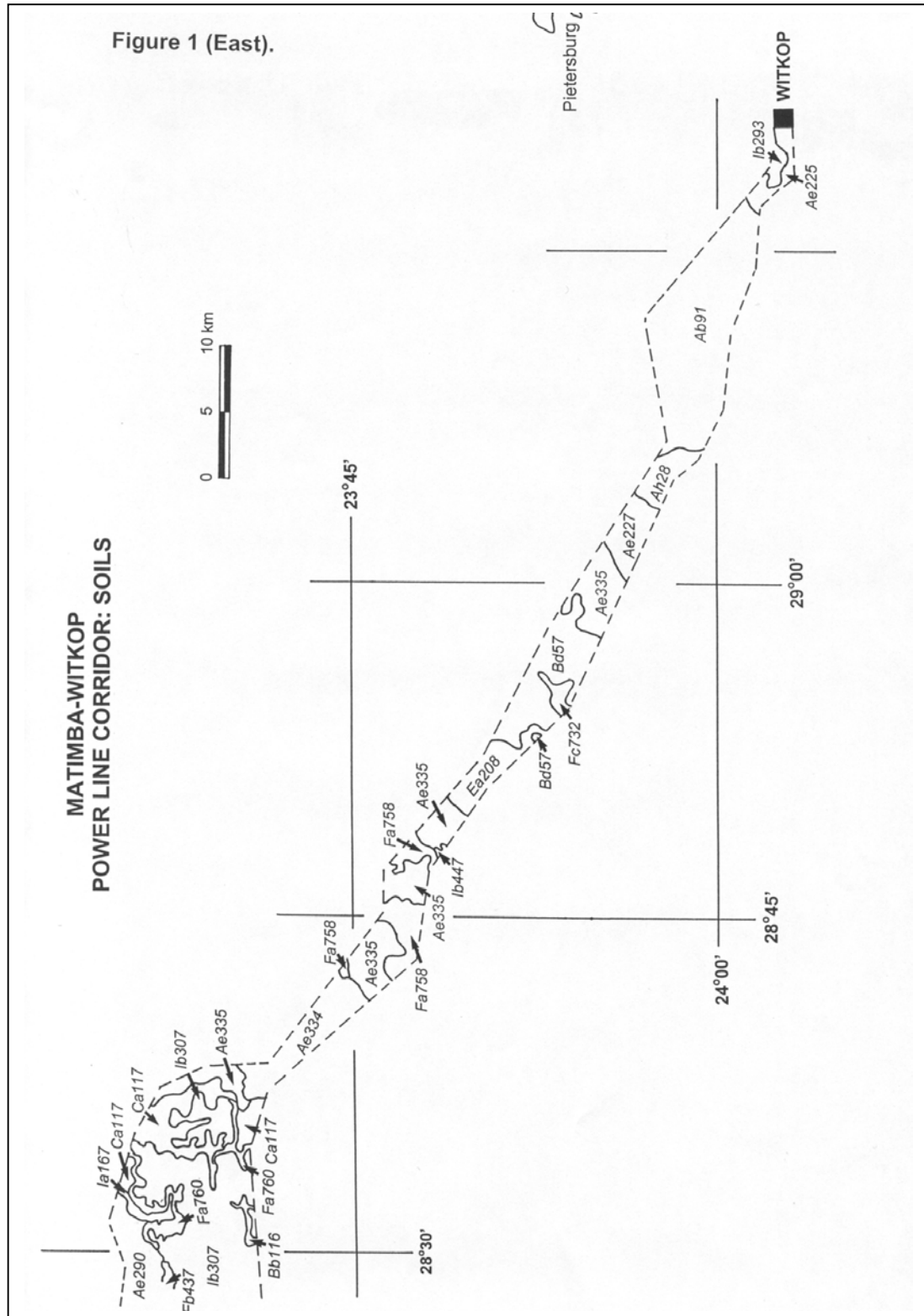


Figure 3.2b: Land type boundaries for eastern section of study area (single solid lines) shown in relation to the proposed Transmission line corridors (double dashed lines)

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.

3.9. Flora

3.9.1. *Vegetation Types and Condition within the Study Area*

Four vegetation types occur within the study area (Low & Rebelo, 1996). Mixed Bushveld (Vegetation Type 18, Low & Rebelo 1996) is the dominant vegetation type within the study area (75 – 82%). Other vegetation types include Sweet Bushveld (Vegetation Type 17, Low & Rebelo 1996), Sour Bushveld (Vegetation Type 12, Low & Rebelo 1996), and a narrow strip of Clay Thorn Bushveld (Vegetation Type 14, Low & Rebelo 1996; refer to Figure 3.3).

Large areas of the Mixed Bushveld to the east of the Waterberg Biosphere Reserve, as well as most of the Clay Thorn Bushveld are cultivated (approximately 40%). The rural areas utilised for grazing display various degrees of degradation, depending on the stocking rates and level of farm management. Serious degradation due to overgrazing and the absence of correct grazing management programs was recorded within these rural areas. Another feature of the rural agricultural areas within this section of the study area is the almost total eradication of all trees and shrubs.

To the west of, and within the Waterberg Biosphere Reserve, most of the area is utilised for grazing (livestock, game or mixed systems), especially within corridor 1, which traverses an area known for its rugged terrain. The bush in this area is very dense in certain areas, with the tree canopy layer often growing quite tall (15 - 20 m). Within corridor 2, the tree layer is typically shorter, the soils are generally deeper, and crop production may be the main agricultural activity on some farms. Various instances of bush encroachment were also recorded within all corridors with *Dichrostachys cinerea* (sicklebush) and *Acacia tortilis* being the main encroacher species.

3.9.2. *Red Data Species*

None of the plant species recorded in the study area are found in the “Red Data List of Southern African Plants” (Craig Hilton-Taylor, 1996) or on the updated PRECIS database of the National Botanical Institute (NBI), Pretoria.

However, due to the diversity in potential microhabitats specifically within the rugged, mountainous terrain of the Waterberg Biosphere Reserve, it is anticipated that several Red Data plant species and/or protected plant species have the potential to occur within this area. A list of Red Data species (Table 3.1) was compiled according to the PRECIS databank of the NBI, Pretoria.

Table 3.1: Red Data species that may occur within the study area

Species	Status *	Likelihood of occurrence according to main habitat preferences			
		Clay Thorn Bushveld	Waterberg Moist Mountain Bushveld	Sweet Bushveld	Mixed Bushveld
<i>Euphorbia groenewaldii</i> (dwarf succulent)	E	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Euphorbia clivicola</i> (dwarf succulent)	V	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Euphorbia waterbergensis</i> (succl. shrub)	V	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Warburgia salutaris</i> (tree)	V	Highly unlikely	Highly likely	Unlikely	Possible
<i>Asclepias fallax</i> (herb)	R	Unlikely	Possible	Unlikely	Possible
<i>Asclepias eminens</i> (herb)	R	Unlikely	Possible	Unlikely	Possible
<i>Aloe vryheidensis</i> (succulent shrub)	R	Highly unlikely	Possible	Highly unlikely	Unlikely
<i>Anacampseros rhodesica</i> (dwarf succul.)	R	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Boscia foetida</i> subsp. <i>minima</i> (shrub)	R	Unlikely	Likely	Possible	Possible
<i>Brachystelma minor</i> (herb)	R	Unlikely	Highly likely	Unlikely	Likely
<i>Bulbine brunsvigiaefolia</i> (herb)	R	Highly unlikely	Possible	Unlikely	Likely
<i>Combretum petrophilum</i> (shrub/tree)	R	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Euphorbia restricta</i> (succulent shrublet)	R	Highly unlikely	Possible	Highly unlikely	Unlikely
<i>Gladiolus dolomiticus</i> (herb)	R	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Otholobium polyphyllum</i> (shrub)	R	Highly unlikely	Possible	Unlikely	Likely
<i>Sartidia jucunda</i> (grass)	R	Highly unlikely	Likely	Highly unlikely	Unlikely
<i>Tetradenia barberae</i> (shrub)	R	Highly unlikely	Highly likely	Unlikely	Likely
<i>Barleria rehmannii</i> (herb)	K	Possible	Likely	Possible	Possible
<i>Barleria bolusii</i> (herb)	K	Highly unlikely	Unlikely	Possible	Likely
<i>Bowiea volubilis</i> (herb)	K	Highly unlikely	Highly likely	Unlikely	Possible

Species	Status *	Likelihood of occurrence according to main habitat preferences			
		Clay Thorn Bushveld	Waterberg Moist Mountain Bushveld	Sweet Bushveld	Mixed Bushveld
<i>Euphorbia louwii</i> (succulent shrub)	K	Highly unlikely	Highly likely	Highly unlikely	Possible
<i>Lophacme digitata</i> (grass)	K	Highly unlikely	Likely	Unlikely	Possible
<i>Loudetia pedicellata</i> (grass)	K	Highly unlikely	Possible	Unlikely	Likely
<i>Melhania integra</i> (herb)	K	Highly unlikely	Possible	Unlikely	Likely
<i>Mosdenia leptostachyus</i> (grass)	K	Highly unlikely	Possible	possible	Likely
<i>Ozoroa albicans</i> (shrub)	K	Highly unlikely	Likely	Unlikely	Possible
<i>Parapodium costatum</i> (herb)	K	Unlikely	Likely	Possible	Likely
<i>Rhynchosia nitens</i> (shrub)	K	Possible	Likely	Possible	Highly likely
<i>Salvia dolomitica</i> (shrub)	K	Highly unlikely	Likely	Unlikely	Likely
<i>Tristachya biseriata</i> (grass)	K	Highly unlikely	Likely	Unlikely	Possible

R – Rare; V – Vulnerable; K – Insufficiently known

According to this list, the following breakdown of red data species occurrence can be made:

- **Endangered Species:** At least one species that is categorised as Endangered (*Euphorbia groenewaldii*, dwarf succulent) may occur in the study area, with a high likelihood of occurrence in the Waterberg Moist Mountain Bushveld corridor 1.
- **Vulnerable Species:** three Vulnerable species, i.e. *Euphorbia clivicola* (dwarf succulent), *Euphorbia waterbergensis* (succl. shrub) and *Warburgia salutaris* (tree), have a high likelihood of occurrence in the same area.
- **Rare Species:** Thirteen Rare species may possibly occur within the study area, of which six may in all likelihood occur along corridor 1 in the Waterberg Moist Mountain Bushveld (Table 3.1).
- Another thirteen species which is insufficiently Known may also occur within the study area (Table 3.1).

A permit is required to be obtained for the removal of any Red Data plant species, in terms of Article 98 of the Transvaal Nature Conservation Ordinance (No 12 of 1983), which applies to the old Transvaal area including the Northern Province.

Apart from the Red Data species, several species occurring in the study area are listed in the Transvaal Nature Conservation Ordinance (No 12 of 1983) as protected and specially protected plants:

- *Scadoxys multiflora*
- *Huernia hystrix*
- *Amocharis coranica*
- *Aloe* – several species
- *Cussonia* - several species
- *Protea* - several species

3.10. Terrestrial Fauna

The Waterberg Biosphere area is rich in biodiversity and habitat. Endangered species such as black rhino, roan and sable antelope all have been successfully reintroduced into the area. Other species which have been reintroduced into the area include lion, elephant, hippo, leopard, buffalo and numerous antelope species.

Threatened/endemic wildlife occurring in the Waterberg Biosphere Reserve area include the Waterberg Dwarf Gecko, the Waterberg Girdled Lizard, and the Waterberg Flat Lizard. These species are virtually restricted to this rugged terrain. Both the Dwarf Flat Lizard and the Relict Flat Lizard have global ranges restricted to the Waterberg and nearby Soutpansberg (Barnes, 1998).

3.11. Avifauna

Vegetation type is one of the most important factors influencing bird distribution (Harrison *et. al*, 1997), as it directly influences the species composition, abundance and range. The study area falls within the Pietersburg Plateau. The original vegetation that prevailed in the area contained elements of arid woodland, moist woodland and sour grassland. In general, the western section of the study area between the Matimba Substation and the Masebe Nature Reserve is generally far less impacted by human activity than the eastern section of the study area up to the Witkop Substation.

3.11.1. Western Section of Study Area

The dominant land use within the western section of the study area is commercial game farms and nature reserves (e.g. the Waterberg Biosphere Reserve that contains the Masebe Nature Reserve and the Moepel Farms Nature Reserve). The habitat is generally intact, except for areas around human settlements where some subsistence farming is evident. The area is mostly savanna, with a distinct grassy understorey and woody upperstorey of trees and tall shrubs. Elements of arid woodland (*Acacia* woodland on alluvial plains) and moist woodland (broadleaved woodland on higher slopes) are interwoven. Several large drainage lines cross through the area, including the Mokolo, Mogalakwena and Lephalala rivers. Intensively irrigated agricultural land is maintained in a narrow strip along these river courses.

3.11.2. Eastern Section of Study Area

The eastern portion of the study area falls within woodland bordered by densely populated, rural townships. The original vegetation cover within this area has been extensively degraded by human activity, particularly as a result of bush clearing to make way for grazing, dry land cultivation and settlements. Erosion is also extensive in places. However, pockets of the original vegetation survive intact. The area is characterised by extensive electrical infrastructure development, since the Witkop Substation is located here. This substation serves as the central point for many high voltage Transmission lines running to and from it. The area also contains a substation with several powerlines emanating from here. The area has a high population density, with many smallholdings. The land cover is a patchwork of agricultural land, including several irrigated fields adjacent to the Witkop Substation, and degraded woodland.

3.12. Tourism Attractions

The Northern Province offers nearly a third of South Africa's game and wildlife product (30%), followed closely by Mpumalanga (20%), KwaZulu-Natal (17%) and the Eastern Cape (11%). The Northern Province and Mpumalanga together comprise close to half of South Africa's game and wildlife product (refer to Figure 3.4 overleaf).

The popularity of the Northern Province, and particularly the Waterberg Region for eco-tourism development is related to the following:

- The area is deemed to be malaria free.

- There is a tremendous diversity of landscape and vegetation, including mountain, riverine, middle-bushveld, and savannah woodland.
- The tremendous diversity of wildlife and bird species.
- The abundance of San Rock Art sites.
- Easy access from Gauteng.

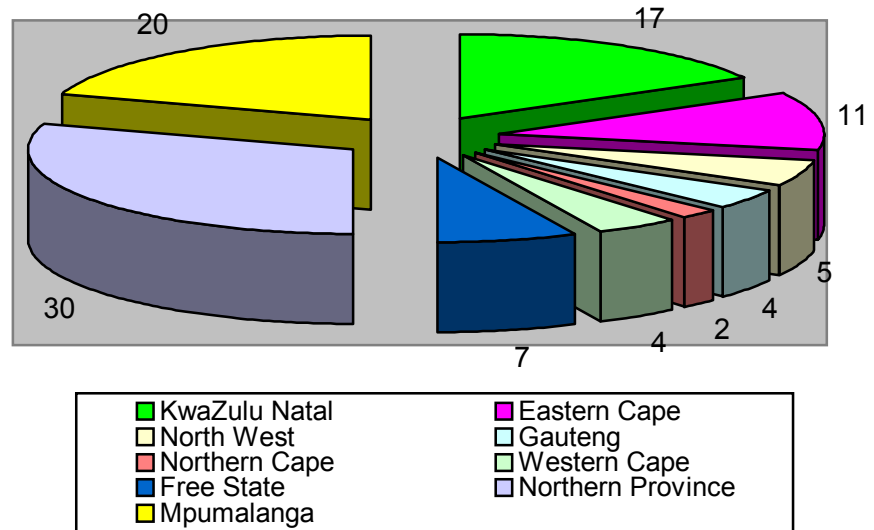


Figure 3.4: South Africa's game/wildlife product supply by Province (Grant Thornton Kessel Feinstein, 2001)

A number of tourism attractions have been identified within the study area. These are briefly discussed below.

3.12.1. D’Nyala Game Reserve

D’Nyala Nature Reserve, 8 281 ha in extent, is situated approximately 10 km south of Ellisras on the new Vaalwater road. Tourism-related activities within this reserve include a hiking trail, a game viewing route, and bird-watching facilities.

3.12.2. Zingela Lodge

Zingela Lodge (more commonly known as Ellington Ranch) is situated approximately 18 km west of Ellisras. The 9 600 ha reserve is a combination of four freehold farms. The reserve is used exclusively for commercial hunting and the breeding of endangered species, such as sable antelope.

3.12.3. Rhinoland Safaris

Situated west of Marken, Rhinoland Safaris comprises of a 14 000 ha game farm, which is used for both hunting and photographic safaris. Wildlife species include white rhino, giraffe, sable, impala, blue wildebeest, zebra, tsessebe, gemsbok, nyala and eland, as well as numerous other antelope species.

3.12.4. The Waterberg Biosphere Reserve

The Waterberg Biosphere Reserve was initiated in 1995 and was registered in March 2001 and accredited to the UNESCO MaB programme (refer to www.unesco.org/mab/brlist.htm). The Waterberg Biosphere Reserve extends for more than 150 000 ha, and includes formal conservation areas such as nature reserves, game sanctuaries, and a vast number of private farms. In accordance with the parameters laid down by UNESCO, the Waterberg Biosphere is structured as follows:

- A core area of 114 571 ha. This is required to be an area within the total biosphere system that has high status and is linked to some significant ecological factor, such as the protection of rare plants.
- A buffer zone of 150 000 ha. It is within this zone that general activities, such as hunting, tourism and environmental education, may be practised. The principle objective within this zone must, however, be conservation.
- A transitional zone of 1 500 ha. It is within this zone that farming activities and communities can be accommodated.

A number of luxury game lodges and eco-tourism ventures have been initiated within the Biosphere, including:

- Lapalala Wilderness, a 26 000 ha reserve.
- Touchstone Game Lodge, a luxury game lodge situated within a 17 500 ha reserve.
- Keta Private Nature Reserve, a private luxury game hunting lodge situated within a 18 000 acre reserve.
- Mangweni Game Lodge, a luxury game lodge situated within the central Waterberg Biosphere.
- Kwalata Game Ranch, a game lodge situated in a 900 ha reserve.

Masebe Nature Reserve falls within the Waterberg Biosphere, and is a thickly wooded, mixed bushveld reserve of 4 546 ha in extent on the Potgietersrus/Marken road. San paintings are found on some of the cliffs typical found in this reserve. Two trails of 11 km and 17 km traverse the reserve.

Moepel Farms is situated within the Waterberg Biosphere Reserve and comprises of a number of freehold farms, which have been settled on by previously disadvantaged communities. The main activity in this area is cattle farming, although some subsistence agricultural activities are undertaken.

3.12.5. Twiga Wildlife Sanctuary

Twiga Wildlife Sanctuary is situated approximately 9 km south-west of Marken, and comprises of a total area of approximately 2 300 ha. Approximately 600 ha have been set aside as an endangered breeding species sanctuary, and currently tuberculosis (TB) free buffalo, roan antelope and white rhino are being bred under supervised conditions within this reserve.

3.12.6. Witvinger Nature Reserve

The Witvinger Nature Reserve is approximately 4 450 ha in extent, and is situated to the south of the study area between Potgietersrus and Pietersberg. The reserve has a variety of habitats and landscape, including open plains and mountains. Wildlife species include

bushbuck, kudu, reedbuck, tsessebe, leopard and zebra. It is not envisaged that the reserve will be developed for tourism-related activities in the foreseeable future.

3.12.7. Percy Fyfe Nature Reserve

Percy Fyfe Nature Reserve is situated to the south of the study area, approximately 35 km north-east of Pietersburg. This reserve has been successfully used to breed threatened antelope, especially roan and tsessebe.

Tourism-related activities within the reserve include camping facilities, game viewing, a one-day hiking trail and a circular mountain-bike trail, which forms part of the Thabaphaswa Mountain Bike Trails.

3.12.8. *Kuschke Nature Reserve*

Kuschke Nature Reserve is situated south of Pietersburg and in close proximity to the existing Witkop Substation. The reserve comprises of two separate farm portions, totalling approximately 2 100 ha in extent. The activities currently undertaken on the farm portions include pig farming, chicken farming, nature conservation, beef farming and tourism-related activities. Wildlife species include warthog, impala, blesbuck, bushpig, anteater, and a variety of bird species. This reserve is a well establish Agricultural School, which was founded on 6 July 1935.

3.12.9. *Other Tourism Attractions in the Study Area*

Numerous small eco-tourism and hunting operations have been identified within the study area, mainly between Ellisras and Marken. Some farmers in the Marken area are in the process of forming a conservancy of several thousands of hectares (approximately 60 000 ha) aiming to promote conservation and tourism related activities, and thereby creating employment opportunities for the local community.

3.13. *Visual/Aesthetic Aspects*

Critical areas within the study area in terms of views and visibility include tourism-focussed areas such as the Waterberg Biosphere Reserve area (including Masebe Nature Reserve), and private game farms (such as Zingela Lodge, Rhinoland Safaris, Keta Nature Reserve, etc), public routes, and residences located in close proximity to the proposed corridors.

The numerous existing Transmission and Distribution lines which occur within the study area impose an existing visual impact on the study area. The existing Matimba-Witkop No 1 400 kV Transmission line traverses the visually sensitive Waterberg Biosphere area, and crosses the roads within the study area in several places.

The study area is currently dissected by several roads. Views from these public routes are impacted on where introduced infrastructure (such as Transmission and Distribution lines, railway lines, and fence lines) is located close to, or crosses the road.

3.14. Sites of Archaeological, Cultural and Historical Interest

A number of heritage sites were identified within the study area. These are detailed on Figure 3.5, and discussed below.

- *Site 1 (23° 38' 37,6" S; 27° 52' 53,8" E):*
A small scattering of Late Stone Age (LSA) tools was found at this site. No cores or unmarked flakes were present and combined with the small number of tools. This site can not be seen as representing a manufacturing site.
- *Site 2 (23° 35' 18,5" S; 28° 31' 50,3" E):*
A community graveyard at the village of Kafferboom with approximately 50 graves next to the dirt road. The graveyard is still in use.]
- *Site 3 (23° 41' 32,5" S; 28° 08' 42,1" E):*
A surface scatter of potsherds, daga fragments and even a few stone tools occur at this site. The scatter was of low density and was found in the neck between two hills. The surrounding areas were very rocky as opposed to this area, which was without rocks. A fragment of a grinding stone was also found. Evidence of hut clay or a daga fragment was found all over the site. Possible features like dilapidated stone walls were also encountered. The site extended over an area at the foot of one hill and measured approximately 50 m x 120 m. The site was not very big or rich in feature and artifacts. The *Euphorbias* growing on the side of the hill were most probably brought in by occupants.
- *Site 4 (23° 41' 20,7" S; 28° 08' 40,6" E):*
A small concentration of slag and tuyère fragments was found in the road. The road was slightly graded open to expose scatter. The concentration measured approximately 20 m x 30 m but was of a very low density.
- *Site 5 (23° 41' 33,6" S; 28° 11' 59,1" E):*
A low density scatter of stone tools was found in a sandy area in-between a stretch of exposed rocks. The stone tools consisted of cores, flakes, scrapers and blades. The area measured approximately 100 m x 100 m. Only a surface scatter was found with reworked cores. This was not a production site.

- *Site 6 (23° 41' 32,9" S; 28° 12' 33,2" E):*
A concentration of Late Stone Age tools and microliths were found. The area is slightly disturbed due to development of infrastructure (fencing, a road and the existing 400 kV Transmission line).
- *Site 7 (23° 41' 26,1" S; 28° 14' 51,3" E):*
A low density scattering of Late Stone Age tools was found on this site.
- *Site 8 (23° 45' 15" S; 28° 43' 03" E):*
Abandoned stretches of low stone walling were found. The stone walling was of a recent nature and could be associated with the school approximately 50 m further on. The stone walling was abandoned after recent improvements (such as fencing) at the school (Malapile Primary School). The stone walling appears to be an entrance to the schoolyard.
- *Site 9 (23° 45' 25" S; 28° 43' 31" E):*
A cluster of eleven graves indicated by a paved stone outline dressing was found. These are located on a ploughed field approximately 80 m from the existing 400 kV Transmission line.
- *Site 10 (23° 46' 27" S; 28° 45' 10" E):*
A dilapidated hut foundation and some scattered potsherds indicate the remains of an informal settlement. The settlement has moved during the early 1960s to a formal village in the Vlaktefontein region. The area covered a maximum of 10 ha. The area was destroyed and damaged by the construction of a road and a powerline.
- *Site 11 (24° 02' 39,7" S; 29° 20' 35,8" E):*
A large number of European type structures are located in a 3 – 4 ha area. Several porcelain and metal remains were found. Most of the inhabited area is defined by cacti and large tracts of pioneer plant growths. The document studies seem to indicate that these were the ruins of the Dorsland settlement, which was abandoned during the 1960s. Although no reference to a graveyard could be found, it is highly likely that graves will be located close to this settlement.

- *Site 12 (23° 56' 46,4" S; 29° 03' 46,8" E):*
The remains of an old farmhouse and homestead are located here. The site consists of approximately 4 – 5 buildings within a 50 m x 50 m area. The buildings were constructed from sundried bricks and cement.
- *Site 13 (26° 02' 39,7" S; 29° 20' 35,8" E):*
A historic fenced-in graveyard with 3 graves was recorded on the northern side of Witkop Substation. The graveyard and the layout seems to indicate that the graveyard is of Western or European origin. No names were indicated on the headstones.
- *Site 14 (24° 02' 11" S; 29° 18' 01" E):*
A large area on the northern side of the valley running from Witkop Power Station towards the N1 shows indications of habitation. This was most likely a Late Stone Age site and there is a strong possibility of gravesites being located in the vicinity.