

FIGURE 13: SOIL TYPE MAP OF THE NORTHERN SECTION OF THE SITE

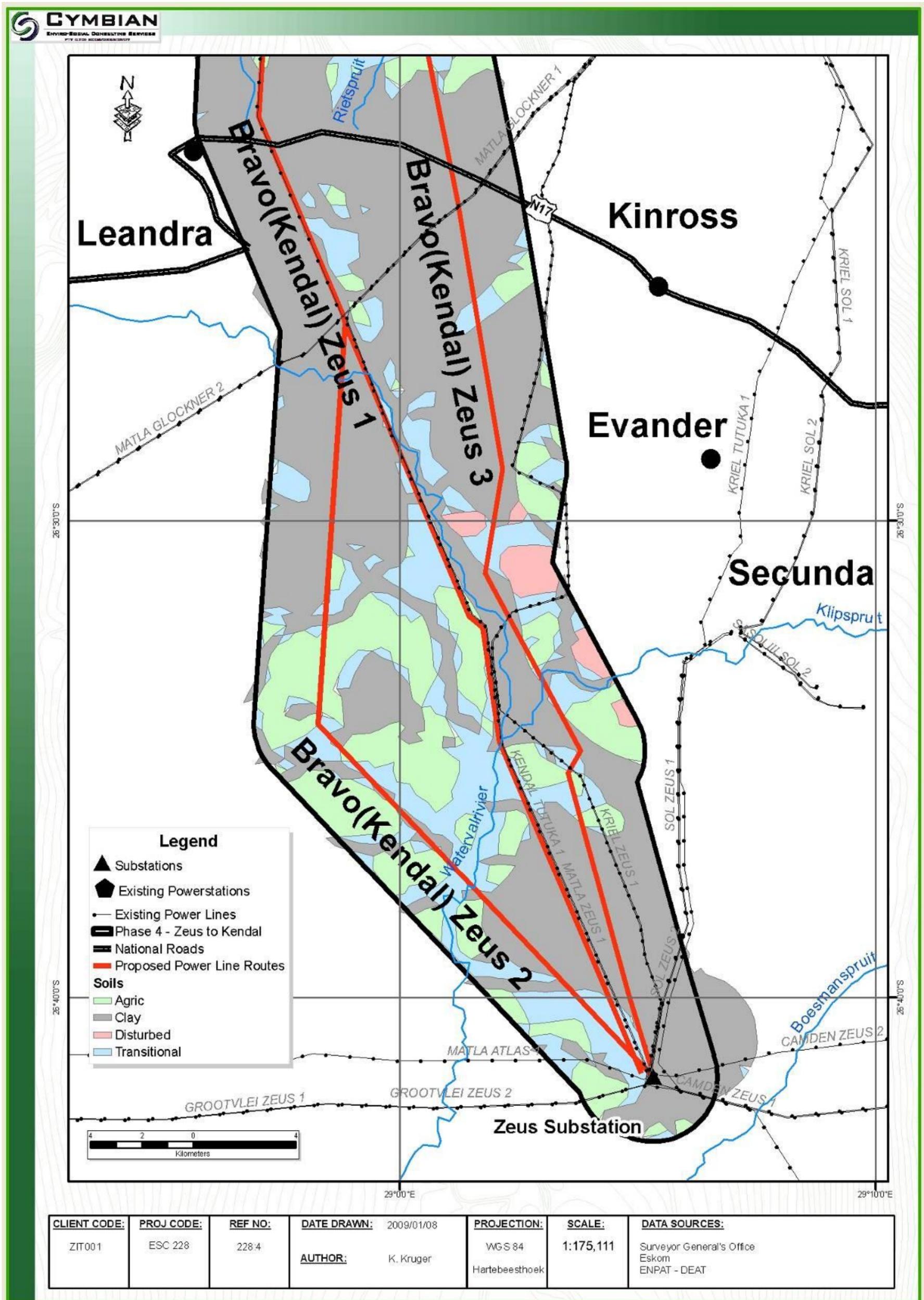


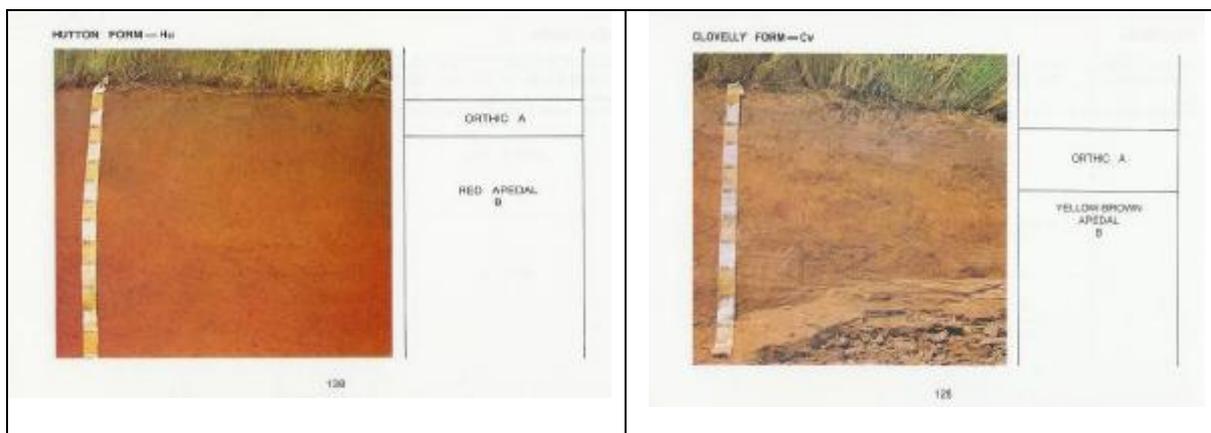
FIGURE 14: SOIL TYPE MAP OF THE SOUTHERN SECTION OF THE SITE

## **Agricultural Soils**

The agricultural soils found on site support an industry of commercial maize production. These soils include Hutton, Clovelly, Avalon, Bainsvlei, Glencoe and Shortlands. These soils have deep red or yellow-brown B-horizons with minimal structure, but in the case of Shortlands soils the B-horizon has some degree of structure. These soils drain well and provide excellent to moderate cultivation opportunities. Each of the soils is described in detail below.

### **Hutton and Clovelly Soil Forms**

Hutton's are identified based on the presence of an apedal (structureless) "red" B-horizon and Clovelly's with an apedal "yellow" B-horizon as indicated in Figure 15 below. These soils are the main agricultural soil in the country due to the deep, well-drained nature of these soils.



**FIGURE 15: HUTTON AND CLOVELLY SOIL FORMS (SOIL CLASSIFICATION, 1991)**

### **Avalon and Bainsvlei Soil Forms**

The Avalon and Bainsvlei soil forms are characterised by the occurrence of a soft plinthic B – horizon (See Figure 17). The Avalon has a yellow-brown B-horizon while the Bainsvlei has a red apedal B-horizon. These horizons are the same as described for the Hutton and Clovelly soils above. The plinthic horizon has the following characteristics:

- Has undergone localised accumulation of iron and manganese oxides under conditions of a fluctuating water table with clear red-brown, yellow-brown or black strains in more than 10% of the horizon;
- Has grey colours of gleying in or directly underneath the horizon; and
- Does not qualify as a diagnostic soft carbonate horizon.

These soils are found lower down the slopes than the Clovelly and Hutton soils and indicate the start of the soils with clay accumulation.

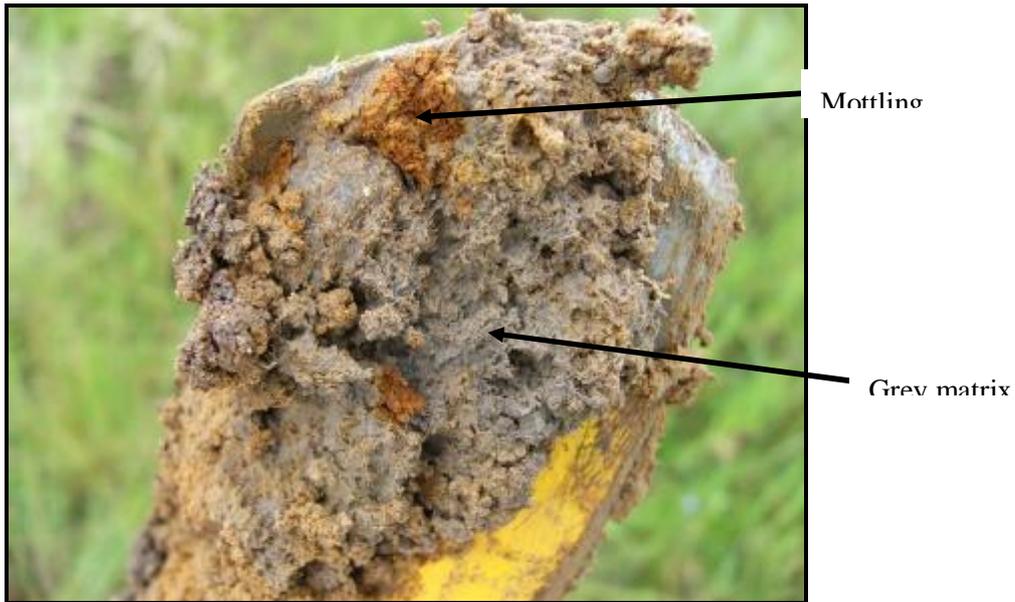


FIGURE 16: SOFT PLINTHIC B-HORIZON.

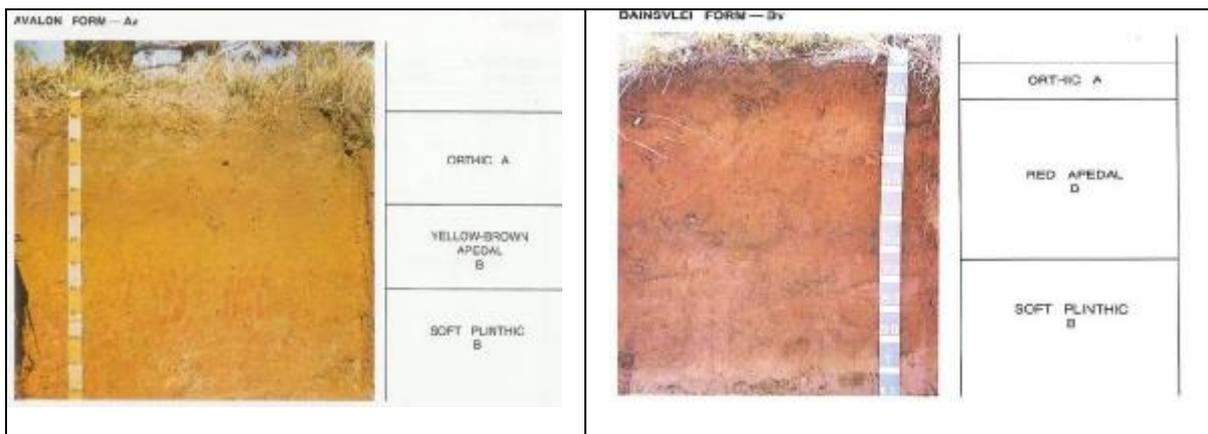


FIGURE 17: AVALON AND BAINSVLEI SOIL FORMS (SOIL CLASSIFICATION, 1991)

Glencoe:

The Glencoe soil form is found in areas where the soft plinthic B-horizon of an Avalon has hardened irreversibly into Hard Plinthite (Ferricrete). Refer to Figure 18 for an illustration of this soil form.

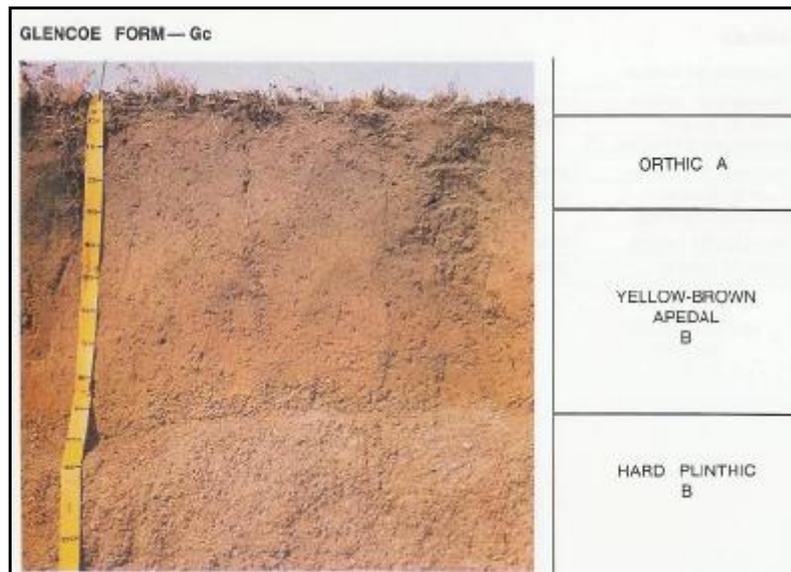


FIGURE 18: GLENCOE SOIL FORM (SOIL CLASSIFICATION, 1991)

Shortlands:

The Shortlands soil form has an Orthic A Horizon over a Red structured B Horizon as illustrated in Figure 19. These soils are very similar to the Hutton soils, the only difference being the formation of a structure in the B-horizon.

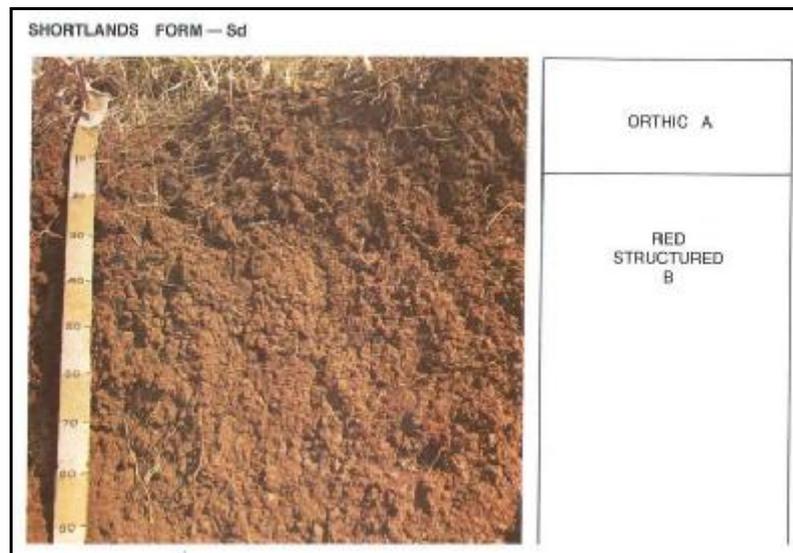


FIGURE 19: SHORTLANDS SOIL FORM (SOIL CLASSIFICATION, 1991)

Rocky Soils

The rocky soil management unit is made up of soils that are generally shallow and that overlie an impeding layer such as hard rock or plinthite. These soils are not suitable for cultivation and in most cases are only usable as light grazing. The unit comprises the following soil forms:

- Mispah (Orthic A horizon over hard rock);

Milkwood (Melanic A horizon over hard rock); This section provides a short sensitivity matrix, which compares the three different alternatives and their associated environmental sensitivities.

**TABLE 9: ALTERNATIVE SENSITIVITY MATRIX**

Sensitivity	Alternative 1	Alternative 2	Alternative 3
Geology	None	None	None
Climate	None	None	None
Topography	None	None	None
Land Use	Traverses short section of ash dump, surrounding land used as grazing for cattle	Traverses Witbank Dam and farmland	Traverses Witbank Dam and agricultural land
Surface Water	Traverses only a short section of the un-named tributaries on site	Traverses a large section of the Witbank Dam	Traverses the largest Section of the Witbank Dam
Soils & Land Capability	Mainly agricultural and non sensitive soils	Along sensitive wetland and clay soils	Along sensitive wetland and clay soils
Flora	None	Sensitive vegetation units and plants present	Sensitive vegetation units and plants present
Fauna	None	None	None
Wetlands	None	Traverses wetland	Traverses wetland
Visual	Low Visibility	Moderate visibility	Highly visibility
Social	Low to None – Site specific	Low– Site specific	Low– Site specific
Heritage	Low	Low	Low
<b>Total Sensitivities</b>	<b>1</b>	<b>4</b>	<b>4</b>

On the basis of the matrix presented above, it is suggested that the Bravo 5 Alternative 1 be utilised as the preferred alternative for the proposed project, as it has the least sensitive features associated with the alignment.

- Dresden (Orthic over hard plinthic);

Mispah

The Mispah soil form is characterised by an Orthic A – horizon overlying hard rock. These soils are especially prevalent in the northern and central parts of the site and are commonly found on rocky ridges our outcrops. Please refer to Figure 20 for an illustration of a typical Mispah soil form.

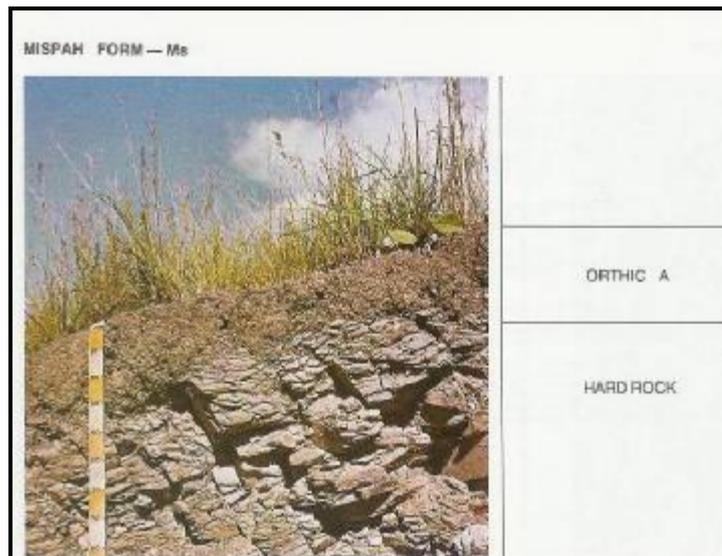


FIGURE 20: MISPAH SOIL FORM (MEMOIRS ON THE NATURAL RESOURCES OF SOUTH AFRICA, NO. 15, 1991).

Milkwood

The Milkwood soil form is characterised by a Melanic A horizon overlying hard rock. These soils dominate the southern parts of the site as they predominantly form from the Dolerite geology. Due to the underlying hard rock, these soils have limited cultivation potential and are most often used for grazing.

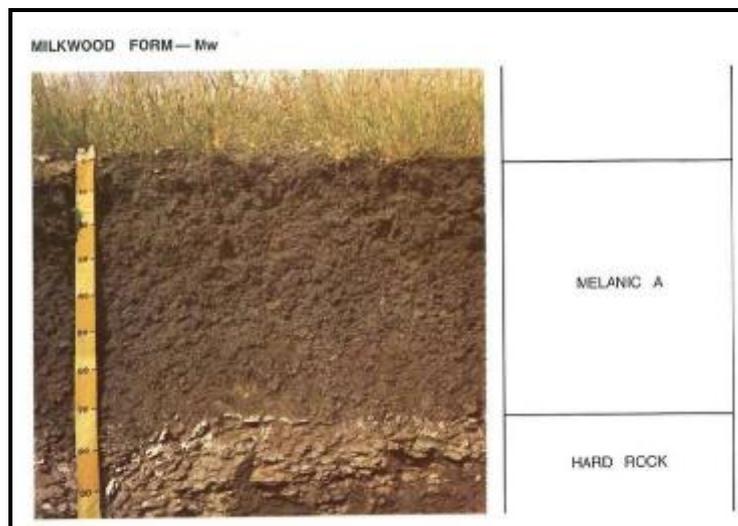


FIGURE 21: MILKWOOD SOIL FORM (SOIL CLASSIFICATION, 1991)

Dresden

The Dresden soil form is characterised by a hard plinthic B-horizon (aka Ferricrete). This horizon develops when a soft plinthic horizon dries out and hardens irreversibly. These shallow soils have very limited potential and are mostly used for light grazing or wildlife.

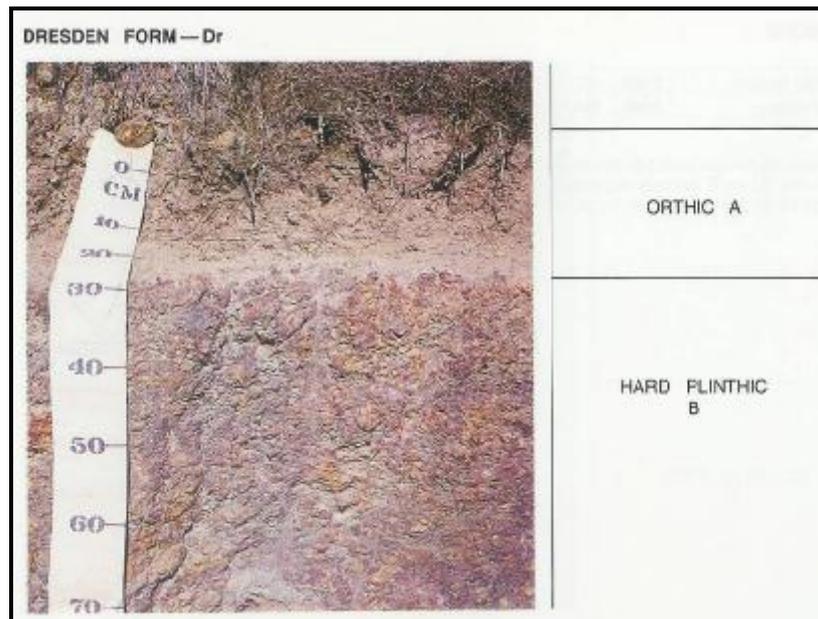


FIGURE 22: DRESDEN SOIL FORM

### Transitional Soils

The transitional soil management unit comprises the soils found between clay soils and the agricultural soils. These soils often have signs of clay accumulation or water movement in the lower horizons. These soils are usually indicative of seasonal or temporary wetland conditions. Soil forms in this unit include:

- Longlands;
- Wasbank;
- Kroonstad; and
- Westleigh;

### Wasbank, Kroonstad, Longlands and Westleigh Soil Forms

The Wasbank, Kroonstad and Longlands soil forms are all typified by an eluvial horizon, while the Westleigh soil form has a shallow soft plinthic horizon. These are also recognized as potential wetland soils. The E-horizon is a horizon that has been washed clean by excessive water movement through the horizon, while the soft plinthic horizon is formed by the accumulation of clays moving through the soil medium. These soils occur adjacent to the drainage channels found on site. Refer to Figure 23 for an illustration of these soil types.

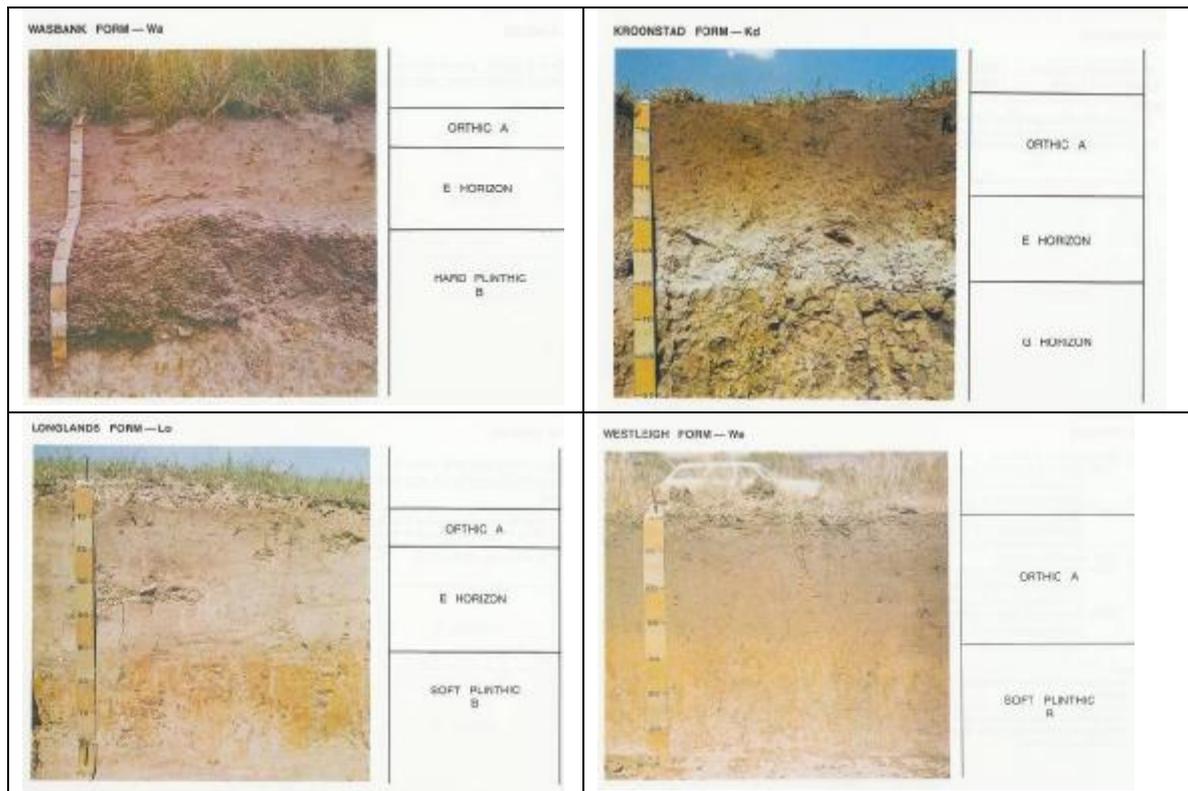


FIGURE 23: WASBANK, KROONSTAD, LOWLANDS AND WESTLEIGH SOIL FORMS (SOIL CLASSIFICATION)

### Clay Soils

The clay soil management unit is found in areas where clays have accumulated to such an extent that the majority of the soil matrix is clays. These soils are usually indicative of seasonal or permanent wetland conditions. Soil forms in this unit include:

- Rensburg;
- Arcadia;
- Inhoek;
- Katspruit;
- Willowbrook;
- Sterkspruit ; and
- Steendal;

### Katspruit and Willowbrook Soil Forms

The Katspruit and Willowbrook soil forms are found in areas of semi-permanent wetness. These soils are typified by an Orthic A horizon (Katspruit) or a Melanic A horizon (Willowbrook) over a diagnostic G horizon, as indicated in Figure 24. The G horizon has several unique diagnostic criteria as a horizon, including:

- It is saturated with water for long periods unless drained;
- Is dominated by grey, low chroma matrix colours, often with blue or green tints, with or without mottling;
- Has not undergone marked removal of colloid matter, usually accumulation of colloid matter has taken place in the horizon;
- Has a consistency at least one grade firmer than that of the overlying horizon;
- Lacks saprolitic character; and
- Lacks plinthic character.

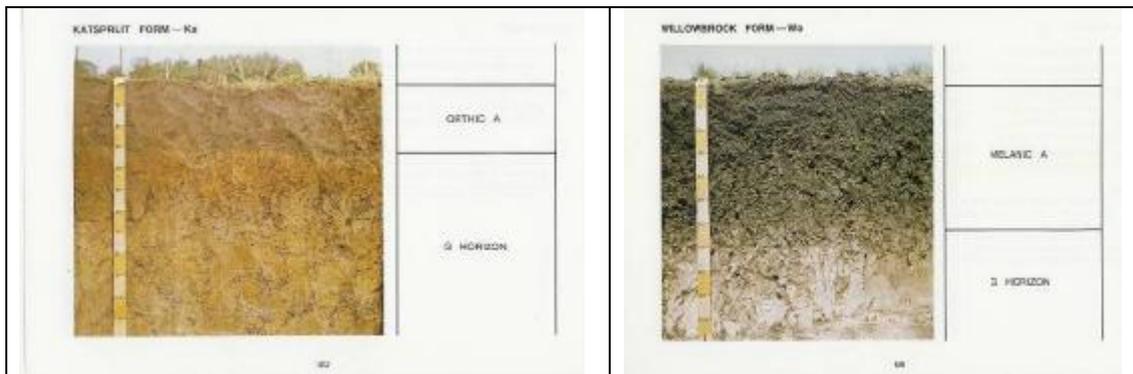


FIGURE 24: KATSPRUIT AND WILLOWBROOK SOIL FORMS (SOIL CLASSIFICATION, 1991)

#### Rensburg and Arcadia soil forms

Arcadia and Rensburg soils are characterised by a vertic A-horizon. In the Rensburg the Vertic A is underlain by a G-horizon as described above, while the Arcadia is a pure vertic horizon. The Vertic horizon has several unique diagnostic criteria as a horizon, namely:

- Has strong developed structure
- Has at least one of the following:
  - Clearly visible, regularly occurring slicken sides in some part of the horizon or in the transition to an underlying layer
  - A plasticity index greater than 32 (using the SA Standard Casagrande cup to determine liquid limit), or greater than 36 (using the British Standard cone to determine liquid limit).

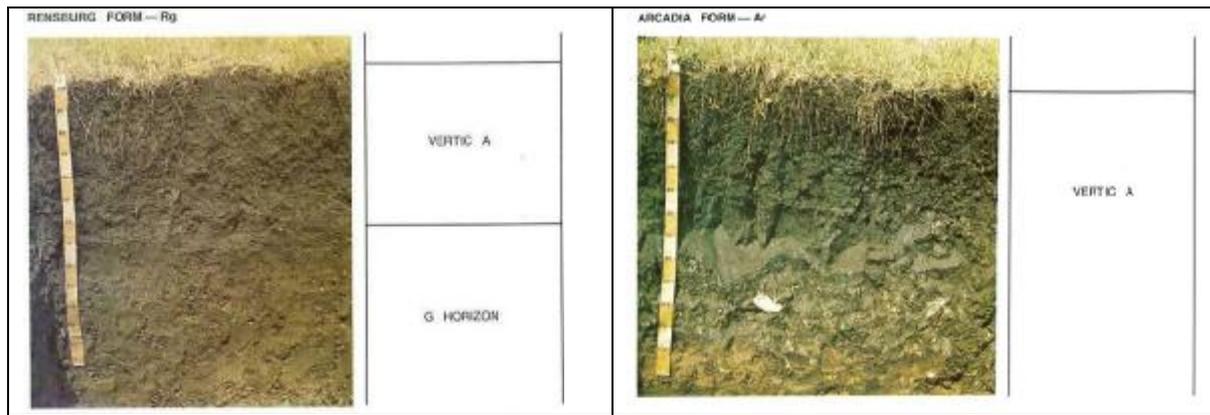


FIGURE 25: RENSBURG AND ARCADIA SOIL FORMS (SOIL CLASSIFICATION, 1991)

Inhoek and Steendal Soil Forms

The Inhoek and Steendal soil forms are typified by a Melanic A horizon. The Melanic horizon is characterised by the following:

- Dark colours in the dry state with a value and chroma of 3 or less with the exception of 10YR 3/3 and colours redder than 5YR;
- No slickensides present as in the vertic clays;

In the case of the Steendal soil form the Melanic A horizon is underlain by a soft carbonate B horizon. This horizon is formed by the accumulation of carbonates in the horizon to such an extent that it dominates the morphology of the soil form. Please refer to Figure 26 for an illustration of the soil types.

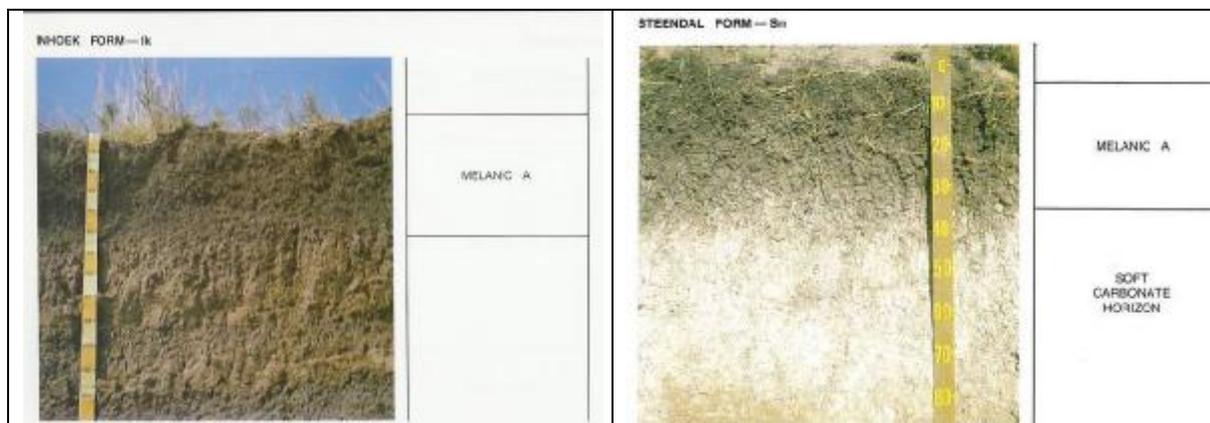


FIGURE 26: INHOEK AND STEENDAL SOIL FORMS (SOIL CLASSIFICATION, 1991)

Sterkspruit:

The Sterkspruit soil form has an Orthic A Horizon over a Prismaeutanic B Horizon over Saprolite with calcareous characteristics as illustrated in Figure 27 below. The effective depth is less than 40cm due to the strong clay accumulations. These soils are marginal and suitable only for grazing. These soils were predominantly found along a stream in the central part of the site.

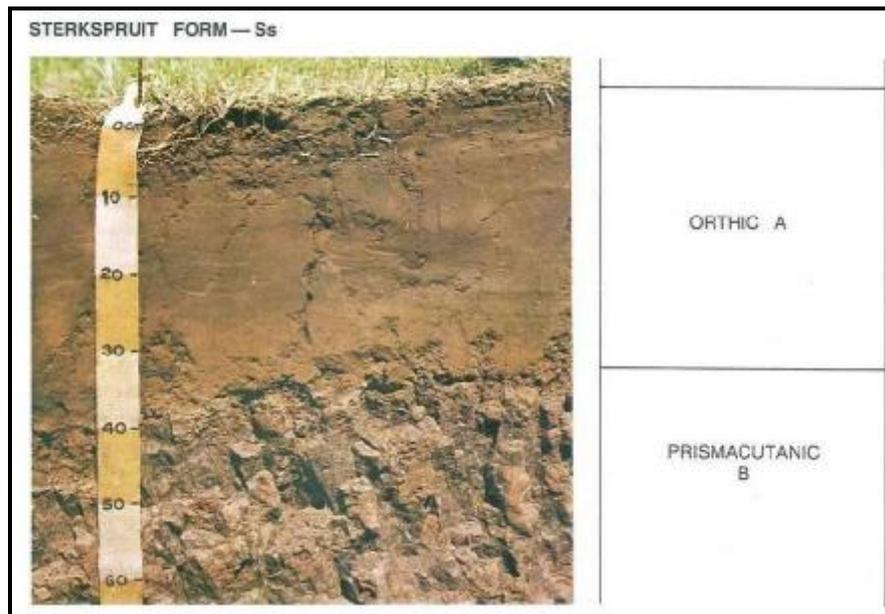


FIGURE 27: STERKSPRUIT SOIL FORM (SOIL CLASSIFICATION, 1991)

### 7.1.6 Land Capability

#### Data Collection

A literature review was conducted in order to obtain any relevant information concerning the area, including information from the Environmental Potential Atlas (ENPAT), Weather Bureau and Department of Agriculture. Results from the soil study were taken into account when determining the land capability of the site.

The land capability assessment methodology as outlined by the National Department of Agriculture was used to assess the soil's capability on site.

#### Regional Description

The regional land capability is mostly class II soils with few limitations. This is evident in the large number of cultivated lands found in the region. In the areas where the soil is too shallow or too wet to cultivate, livestock are grazed.

#### Site Description

The soils identified on site were classified according to the methodology proposed by the Agricultural Research Council – Institute for Soil, Climate and Water (2002). Factors evaluated are tabled below.

The site is made up of two main land capability classes, namely class II – cultivation and class V and VII – grazing. The class II soils are suitable for cultivation and can be used for a wide range of agricultural applications. The class VII soils have continuing limitations that cannot be corrected; in this case rock

complexes, flood hazard, stoniness, and a shallow rooting zone constitute these limitations. Figure 28 illustrates the various land capability units on site.

**TABLE 10: LAND CAPABILITY OF THE SOILS ON SITE FOR AGRICULTURAL USE**

Management unit	Agricultural	Transitional	Disturbed	Clay
Area (ha)	20 810	114 212	1 220	30 555
% of site	12.5	68.5	0.7	18.3
Rock Complex		Yes – hard plinthic	Possible	
Flooding Risk	F1 – None	F2 – Rare	F2 – Rare	F4 - Common
Erosion Risk	E2 – Low to Moderate	E5 – Moderate to High	E5 – Moderate to High	E1 - Low
Slope %	2 – 10 %	2 – 10 %	2 – 20 %	0 – 5 %
Texture	T1 – 15 – 45% Clay	T1 – 15 – 45% Clay	T1 – 15 – 45% Clay	T3 - >55% Clay
Depth	D1 - > 70 cm	D2 – 60 – 80 cm	D2 – 60 – 80 cm	D3 – 40 – 60 cm
Drainage	W2-3 Well – Imperfectly drained	W4 – Somewhat poorly drained	W4 – Somewhat poorly drained	W5 – Poorly drained
Mechanical Limitations	MB0 - None	MB3 – Shallow soils on rock	MB3 – Shallow soils on rock	MB0 - None
pH	pH > 5	pH > 5	pH > 5	pH > 5
Soil Capability	II -	VII	VII	V
Climate Class	C2	C2	C2	C2
Land Capability	II – Arable Land	VII – Light Grazing	VII – Light Grazing	V - Grazing

No limitation	Low to Moderate	Moderate	High	Very Limiting
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