



# DMT

**DMT Kai Batla (Pty) Ltd**

**SOIL AGRICULTURAL POTENTIAL ASSESSMENT  
FOR THE PROPOSED RESIDENTIAL DEVELOPMENT  
IN AERORAND SOUTH.**

**- MIDDELBURG, MPUMALANGA PROVINCE, SOUTH  
AFRICA.**

**ORDER NO. 005290**

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Prepared for:

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Corner of Walter Sisulu and Protea Street

Middelburg

1050

**28 February 2019**

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| DMT Kai Batla (Pty) Ltd                                       |  |
|---|--|
| <b>Project Description</b>                                    | Assessment Of The Agricultural Potential Of Soils At Aerorand South, Middelburg. |
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## EXECUTIVE SUMMARY

DMT Kai Batla (Pty) Ltd (DMT KB) was appointed by Steve Tshwete Local Municipality, to conduct a Soil Agricultural Potential assessment for the proposed Residential development in Aerorand South, near Middelburg in the Mpumalanga province, South Africa. The proposed development is located on Portion 341 of the Remainder of Portion 27 of the farm Middelburg Town and Townlands 287, commonly known as Aerorand South, hereafter referred to as “the Study Area”.

The study area comprises of 101 hectares of land which will be subdivided into 624 stands for the proposed development. Department of Agriculture, Rural Development, Land and Environmental Affairs identified the Soils Agricultural Potential Assessment of as one of the specialist studies to be carried out to inform the Environmental Impact Assessment, as part of the Environmental Authorization Application process.

No agricultural land use activities were identified in the vicinity of the study area during the soil survey. The majority of the study area comprised of natural grassland, surrounded by commercial and residential properties along the eastern and northern boundaries, respectively. Industrial activities were also identified in the vicinity of the study area, including three mining dumps (marked within red circles below) located within a 5km radius from the eastern boundary of the study area, and a small electrical substation located within the north-western portion of the study area.

The majority of the study area comprised of the Glencoe and Hutton soil forms, constituting approximately 35.5 % (40.2 ha) and 31.8% (36 ha) of the study area, respectively. Clovelly and Dresden soil forms were also identified, comprising approximately 11% (12.5 ha) and 13.8% (15.6 ha) of the study area. Whereas the remainder of the study area was occupied by the Wasbank, Fernwood, and Witbank soil forms.

The Witbank soil form comprises of developed areas such that the underlying soil could not be accessed for classification, which were then classified as Witbank soil forms by default. The Witbank soil form is characteristic of the soils that have been extensively modified or buried by historic anthropogenic activities, hence appropriate in this scenario. The areas where the Dresden soil forms were identified appeared to be somewhat transformed, as the hard plinthite layer was exposed to the surface in some of these areas. this likely due to historic anthropogenic activities, such as borrow pits, which is very common in this region.

**DECLARATION**

This report has been prepared according to the requirements as set out in Appendix 6 of the Environmental Impact Assessments EIA Regulations, 2014 (No. R. 982). I, the undersigned, declare the findings of this report free from influence or prejudice.

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Date: 28/02/2019

## DOCUMENT GUIDE

| <b>NEMA Regulations (2014) - Appendix 6</b>  | <b>Relevant section in report</b> |
|--|-----------------------------------|
| Details of the specialist(s) who prepared the report   | Appendix I                        |
| The expertise of that person to compile a specialist report including a curriculum vitae   | Appendix I                        |
| A declaration that the person is independent in a form as may be specified by the competent authority  | Appendix I                        |
| An indication of the scope of, and the purpose for which, the report was prepared  | Section 2.1                       |
| The date and season of the site investigation and the relevance of the season to the outcome of the assessment   | Section 2.4                       |
| A description of the methodology adopted in preparing the report or carrying out the specialised process   | Section 2                         |
| The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure   | Section 3                         |
| An identification of any areas to be avoided, including buffers  | N/A                               |
| A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;                             | Section 3                         |
| A description of any assumptions made and any uncertainties or gaps in knowledge;  | Section 2.2                       |
| A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment  | Section 3 and 4                   |
| Any mitigation measures for inclusion in the EMPr  | Section 5                         |
| Any conditions for inclusion in the environmental authorisation  | Section 4 and 5                   |
| Any monitoring requirements for inclusion in the EMPr or environmental authorisation   | None                              |
| A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and  | Section 5 and 6                   |
| If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan | Section 5 and 6                   |
| A description of any consultation process that was undertaken during the course of carrying out the study  | N/A                               |
| A summary and copies if any comments that were received during any consultation process  | N/A                               |
| Any other information requested by the competent authority.  | None                              |

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## **GLOSSARY OF TERMS**

|                        |   |
|------------------------|---|
| <b>Anthrosol:</b>      | Man-made soil deposit with no recognisable diagnostic soil horizons, including soil materials which have not undergone pedogenesis to an extent that would qualify them for inclusion in another diagnostic horizon.  |
| <b>Contaminant:</b>    | A substance that has a potential to cause harm to human health and/or the environment.  |
| <b><i>In-situ:</i></b> | Implies taking place "locally", or "on site", or "on the premises".   |
| <b>Soil Map Unit:</b>  | A description that defines the soil composition of a land, identified by a symbol and a boundary on a map.  |
| <b>Waste:</b>          | <p>Any substance that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use of for the purposes of production that must be treated or disposed of.</p> <p>Alternatively defined as "an inorganic or organic element or compound that, may exercise detrimental acute or chronic impacts on human health and the environment due to its toxicological, physical, chemical or persistency properties".</p> |

## **ACRONYMS**

|         |  |
|---------|--|
| AGIS    | Agricultural Geo-Referenced Information Systems          |
| IUSS    | International Union of Soil Sciences                     |
| KZN     | KwaZulu Natal  |
| DMT KB  | DMT Kai Batla (Pty) Ltd.                                 |
| RBIDZ   | Richards Bay Industrial Development Zone                 |
| SACNASP | South African Council for Natural Scientific Professions |
| SOTER   | Soil and Terrain   |
| TNPA    | Transnet National Ports Authority                        |

## 1. INTRODUCTION

DMT Kai Batla (Pty) Ltd. (DMT KB) was appointed by Steve Tshwete Local Municipality, to conduct a Soil Agricultural Potential assessment for the proposed Residential development in Aerorand South, near Middelburg in the Mpumalanga province, South Africa. The proposed development is located on Portion 341 of the Remainder of Portion 27 of the farm Middelburg Town and Townlands 287, commonly known as Aerorand South, hereafter referred to as “the Study Area”, as depicted on the locality map in Figure 1 below.

The study area comprises of 101 hectares of land which will be subdivided into 624 stands for the proposed development. Department of Agriculture, Rural Development, Land and Environmental Affairs identified the Soils Agricultural Potential Assessment of as one of the specialist studies to be carried out to inform the Environmental Impact Assessment, as part of the Environmental Authorization Application process.

### 1.1 TERMS OF REFERENCE

This investigative assessment was guided by the following terms of reference:

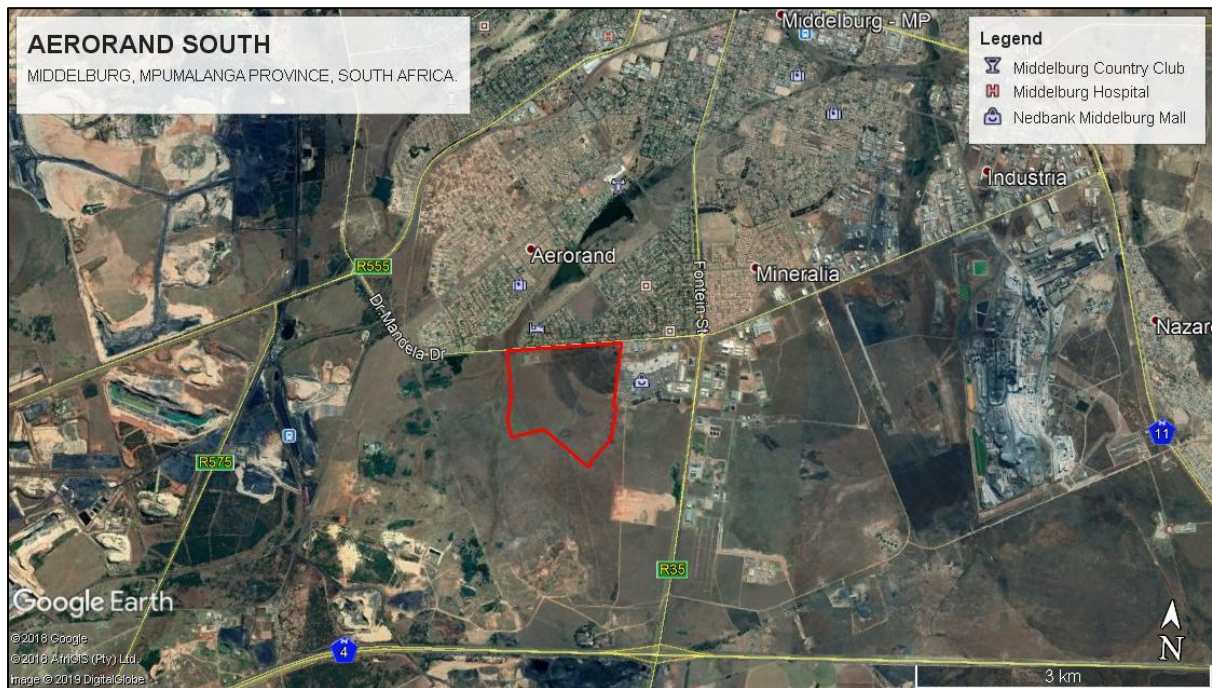
#### **Phase I: Site Assessment**

- Review historic and current land uses as well as existing land capability impacts in the vicinity of the investigated area(s);
- Subsurface soil observations to classify dominant soil type(s) according to the South African Soil Classification System (Soil Classification Working Group, 1991);
- Record survey points on a Global Positioning System (GPS); and include a description of physical soil properties including the following parameters:
  - Terrain morphological units (landscape position);
  - Diagnostic soil horizons and their respective sequence;
  - Depth of the identified soil horizons;
  - Soil form classification name; and
  - Depth to saturation (water table), where encountered.

#### **Phase II: Reporting (Mapping and Impact Assessment):**

- Group uniform soil types into soil map units, according to observed limitations;
- Evaluate the agricultural land capability of the demarcated soil map units;
- Assess the significance of the anticipated impacts of the proposed development on the land capability of the identified soils; and
- Present the assessment findings in a form of an electronic report including:
  - A Soil Type Map, indicating the delineated soil types within the study area;
  - Photos of current environmental conditions and adjacent land uses in the vicinity of the study area;

- A Land Capability Map, illustrating the agricultural land capability and suitability of the identified soil forms to alternative land uses including arable agriculture, forestry, grazing etc.;
- A discussion of the identified impacts and their respective significance on the identified soils and agricultural land capability; and
- An integrated mitigation approach and management practices to be implemented in order to alleviate the identified impacts.



**Figure 1: Locality map with satellite imagery depicting the location of the study area and surrounding areas.**

## 2. METHOD OF ASSESSMENT

The scope of this investigation included both a desktop and fieldwork assessment, as briefly described below:

- Desktop screening and field verification assessment will be conducted within the proposed project footprint of approximately 101 hectares, according to the provided Terms of Reference (ToR);
- An Impact assessment will be carried out to identify and assess the significance of potential impacts of the proposed development on the land use and land capability of the investigated area; and
- A baseline Agricultural Land Capability report will be compiled, where key mitigation and management measures will be recommended to alleviate the identified impacts on agricultural resources.

## **2.1 ASSUMPTIONS AND LIMITATIONS**

As part of this assessment, it is acknowledged that sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked in this assessment. However, it is the opinion of the specialist that this assessment was carried out with adequate sampling and sufficient analytical detail to enable the applicant, the Environmental Assessment Practitioner (EAP), and the regulating authorities to make an informed decision regarding the proposed development.

Soil fertility status was not considered a limitation, since inherent nutrient deficiencies and/or toxicities can be rectified by appropriate liming and/or fertilization prior to cultivation. The agricultural land capability was classified according to current soil physical limitations, with respect to prevailing local climatic conditions. However, it is virtually impossible to achieve 100% purity in soil mapping due to restricted visibility beneath the ground surface. As such, the delineated soil map units could include other soil type(s), and the boundaries between the delineated soils map units are not absolute, but rather form a continuum and gradually change from one type to another. Therefore, soil mapping and the findings of this assessment were extrapolated from individual observation points, and the boundaries are considered the best estimate of the different soil types and land capability classes.

The purpose and scope of this investigation does not include a geotechnical assessment; therefore, the geotechnical stability of the soils will require further assessment and verification by a structural engineer.

## **2.2 DESKTOP ASSESSMENT**

Prior to the commencement of the field assessment, a background analysis, including a literature review, was conducted to collect the existing baseline soil and land capability data in the vicinity of the study area. Various data sources including, but not limited to, the Agricultural Geo-Referenced Information System (AGIS) and other sources as listed under references (Section 7) were used for the assessment.

## **2.3 FIELD INVESTIGATION**

A soil survey was conducted on 14 - 15 February 2019, where the identified soils within the study area were classified into soil forms according to the Taxonomic Soil Classification System for South Africa (1991). Subsurface soil observations were made using a manual hand auger in order to assess individual soil profiles, and this entailed evaluating physical soil properties and prevailing limitations to various land uses.

## **2.4 SOIL MAPPING**

Relatively similar soil forms identified within uniform terrain units were grouped into map units, with respect to observed limitations. Soils with relatively equivalent potential (i.e. soils with relatively similar limitations) were then assigned into predetermined land capability classes.

## 2.5 LAND CAPABILITY CLASSIFICATION

High potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture supply needed to produce sustained economically high crop yields when treated and managed according to best possible farming practices (Scotney et al., 1987). Agricultural land capability is measured on a scale from I to VIII, as presented in **Table 1** below. Classes I to III are classified as prime agricultural land that is well suitable for annual cultivated crops. Class IV soils may be cultivated under certain circumstances and management practices, whereas Classes V to VIII are not typically suitable for cultivation, but may be suitable for grazing and other recreational purposes, and/or ecological conservation (wilderness).

In addition, the climate capability is also measured on a scale from 1 to 8, as illustrated in **Table 2** below. Therefore, the land capability rating is adjusted, depending on the prevailing climatic conditions as indicated by the respective climate capability rating.

**Table 1: Land Capability Classification (Scotney et al., 1987).**

| Land Capability Group | Land Capability Class | Increased intensity of use |   |    |    |    |    |    |    |     | Limitations  |
|-----------------------|-----------------------|----------------------------|---|----|----|----|----|----|----|-----|--|
| <b>Arable</b>         | I                     | W                          | F | LG | MG | IG | LC | MC | IC | VIC | No or few limitations. Very high arable potential. Very low erosion hazard |
|                       | II                    | W                          | F | LG | MG | IG | LC | MC | IC | -   | Slight limitations. High arable potential. Low erosion hazard              |
|                       | III                   | W                          | F | LG | MG | IG | LC | MC | -  | -   | Moderate limitations. Some erosion hazards                                 |
|                       | IV                    | W                          | F | LG | MG | IG | LC | -  | -  | -   | Severe limitations. Low arable potential. High erosion hazard.             |
| <b>Grazing</b>        | V                     | W                          | - | LG | MG | -  | -  | -  | -  | -   | Water course and land with wetness limitations                             |
|                       | VI                    | W                          | F | LG | MG | -  | -  | -  | -  | -   | Limitations preclude cultivation. Suitable for perennial vegetation        |
|                       | VII                   | W                          | F | LG | -  | -  | -  | -  | -  | -   | Very severe limitations. Suitable only for natural vegetation              |
| <b>Wildlife</b>       | VIII                  | W                          | - | -  | -  | -  | -  | -  | -  | -   | Extremely severe limitations. Not suitable for grazing or afforestation.   |

W - Wildlife

F - Forestry

LG - Light grazing

MG – Moderate grazing

IG - Intensive grazing

LC - Light cultivation

MC - Moderate cultivation  
cultivation

IC - Intensive cultivation.

VIC – Very intensive

**Table 2: Climate Capability Classification (Scotney et al., 1987).**

| <b>Climate Capability Class</b> | <b>Limitation Rating</b> | <b>Description</b>   |
|---------------------------------|--------------------------|--|
| C1                              | None to slight           | Local climate is favourable for good yield for a wide range of adapted crops throughout the year.  |
| C2                              | Slight                   | Local climate is favourable for good yield for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperatures increase risk and decrease yields relative to C1. |
| C3                              | Slight to moderate       | Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.  |
| C4                              | Moderate                 | Moderately restricted growing season due to low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.              |
| C5                              | Moderate to severe       | Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops may be grown at risk of some yield loss.  |
| C6                              | Severe                   | Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops for which frequently experience yield loss.   |
| C7                              | Severe to very severe    | Severely restricted choice of crops due to heat, cold and/or moisture stress.  |
| C8                              | Very severe              | Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.   |

### 3. ASSESSMENT RESULTS

#### 3.1 DESKTOP ANALYSIS

The desktop assessment results were obtained from various data sources including, but not limited to, the Agricultural Geo-referenced Information System (AGIS) and other sources as listed under references. The available Soil Terrain (SOTER) and geological data indicate that the study area comprises of soil with very little to no profile differentiation, classified as haplic Acrisols (ACh), primarily derived from Sandstone and greywacke parent material (IUSS, 2014).

#### 3.2 HISTORIC AND CURRENT LAND USE

No agricultural land use activities were identified in the vicinity of the study area during the soil survey. The majority of the study area comprised of natural grassland, surrounded by commercial and residential properties along the eastern and northern boundaries, respectively, as depicted in **Figure 2** below.



**Figure 2: View of the surrounding land uses in the vicinity of the study area.**

Industrial activities were also identified in the vicinity of the study area, including three mining dumps (marked within red circles below) located within a 5km radius from the eastern boundary of the study

area, and a small electrical substation located within the north-western portion of the study area, as depicted on the background of the pictures in **Figure 3 below**.



**Figure 3: View of the industrial land uses in the vicinity of the study area.**

An isolated cluster of bamboo vegetation was also identified towards the eastern boundary, heavily populated by weaver nests (**Figure 4**).



**Figure 4: View of the identified weaver habitat along the eastern boundary of the study area.**

### 3.3 DOMINANT SOIL TYPES

The majority of the study area comprised of the Glencoe and Hutton soil forms, constituting approximately 35.5 % (40.2 ha) and 31.8% (36 ha) of the study area, respectively. Clovelly and Dresden soil forms were also identified, comprising approximately 11% (12.5 ha) and 13.8% (15.6 ha) of the study area. Whereas the remainder of the study area was occupied by the Wasbank, Fernwood, and Witbank soil forms. The relative distribution of the identified soil forms is illustrated in the soil map (**Figure 5**) below, with respective extent of each soil form presented in **Table 7** below.

**Table 7: Soil form distribution within the study area**

| <b>SOIL Form</b> | <b>Area (ha)</b> | <b>% Extent</b> |
|------------------|------------------|-----------------|
| Hutton           | 36.0             | <b>31.8</b>     |
| Clovelly         | 12.5             | 11.0            |
| Glencoe          | 17.0             | 15.1            |
| Gc02             | 23.1             | 20.4            |
| Fw               | 3.3              | 2.9             |
| Av               | 0.6              | 0.5             |
| Wa               | 1.9              | 1.7             |
| Dr               | 15.6             | 13.8            |
| Wb               | 3.2              | 2.8             |

The Witbank soil form comprises of developed areas such that the underlying soil could not be accessed for classification, which were then classified as Witbank soil forms by default. The Witbank soil form is characteristic of the soils that have been extensively modified or buried by historic anthropogenic activities, hence appropriate in this scenario.

A distinction was made within the Glencoe soil forms according to depth characteristics, where relatively deep Glencoe soil forms were categorized as Glencoe 01, and the shallower counterpart as Glencoe 02. The areas where the Dresden soil forms were identified appeared to be somewhat transformed, as the hard plinthite layer was exposed to the surface in some of these areas. This likely due to historic anthropogenic activities, such as borrow pits, which is very common in this region.

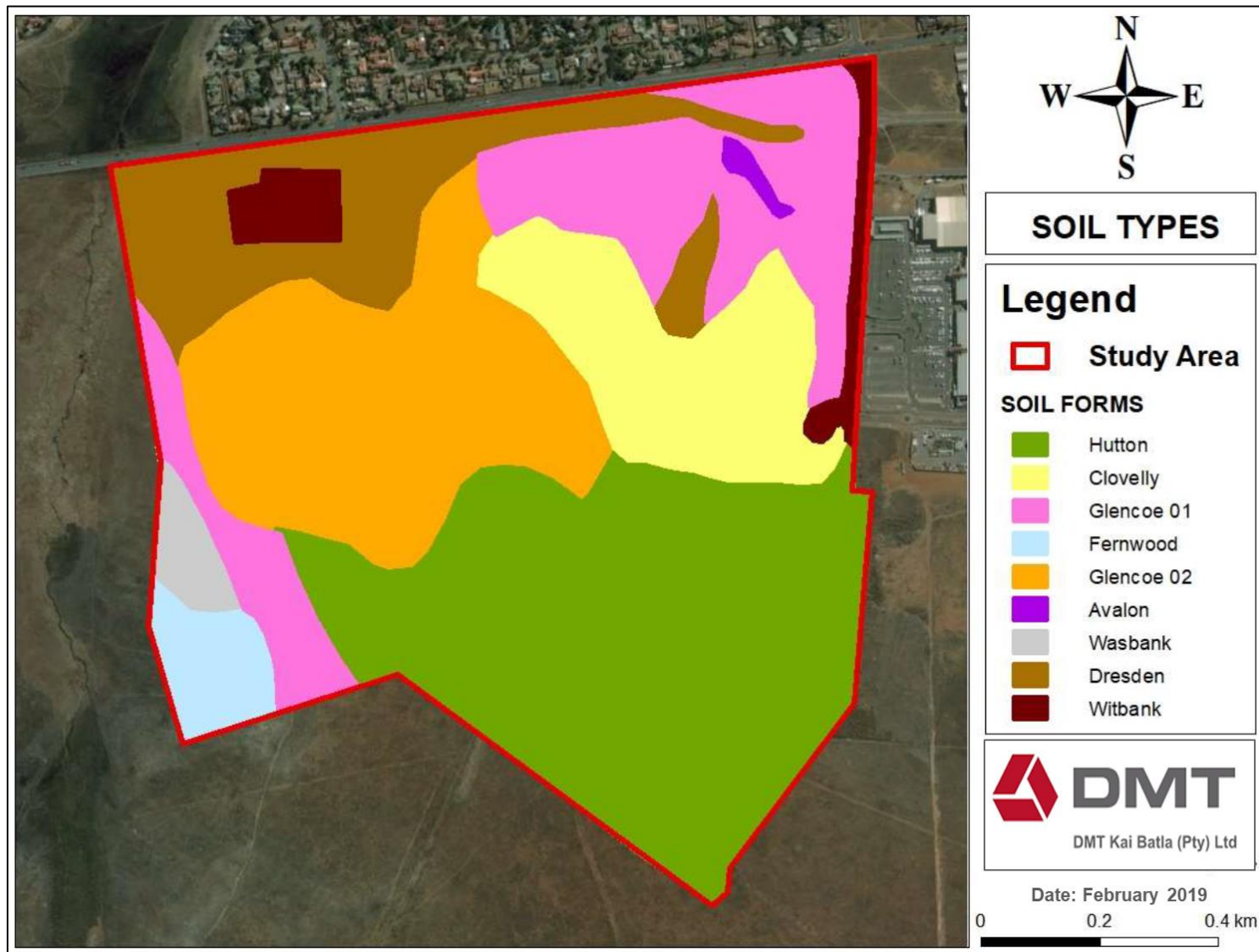


Figure 5: Soil map depicting the spatial distribution of the identified soil forms within the study area.

### 3.4 LAND CAPABILITY CLASSIFICATION

In South Africa, agricultural land capability is generally restricted by climatic conditions, particularly water availability. However, even within similar climatic zones, different soil types typically have different land use capabilities attributed to their inherent characteristics.

For the purposes of this assessment, land capability was inferred from physical soil properties and prevailing local climatic conditions. The surveyed area is considered to fall within Climate Capability Class 4, with a moderately restricted growing season and good yield potential for a moderate range of adapted crops. The identified soils were classified into four land capability classes as presented in **Figure 6** below, and the identified land capability limitations for the identified soils are discussed in a comprehensive summary presented in **Tables 3 - 7** below, with representative photos and spatial extents of each soil form.

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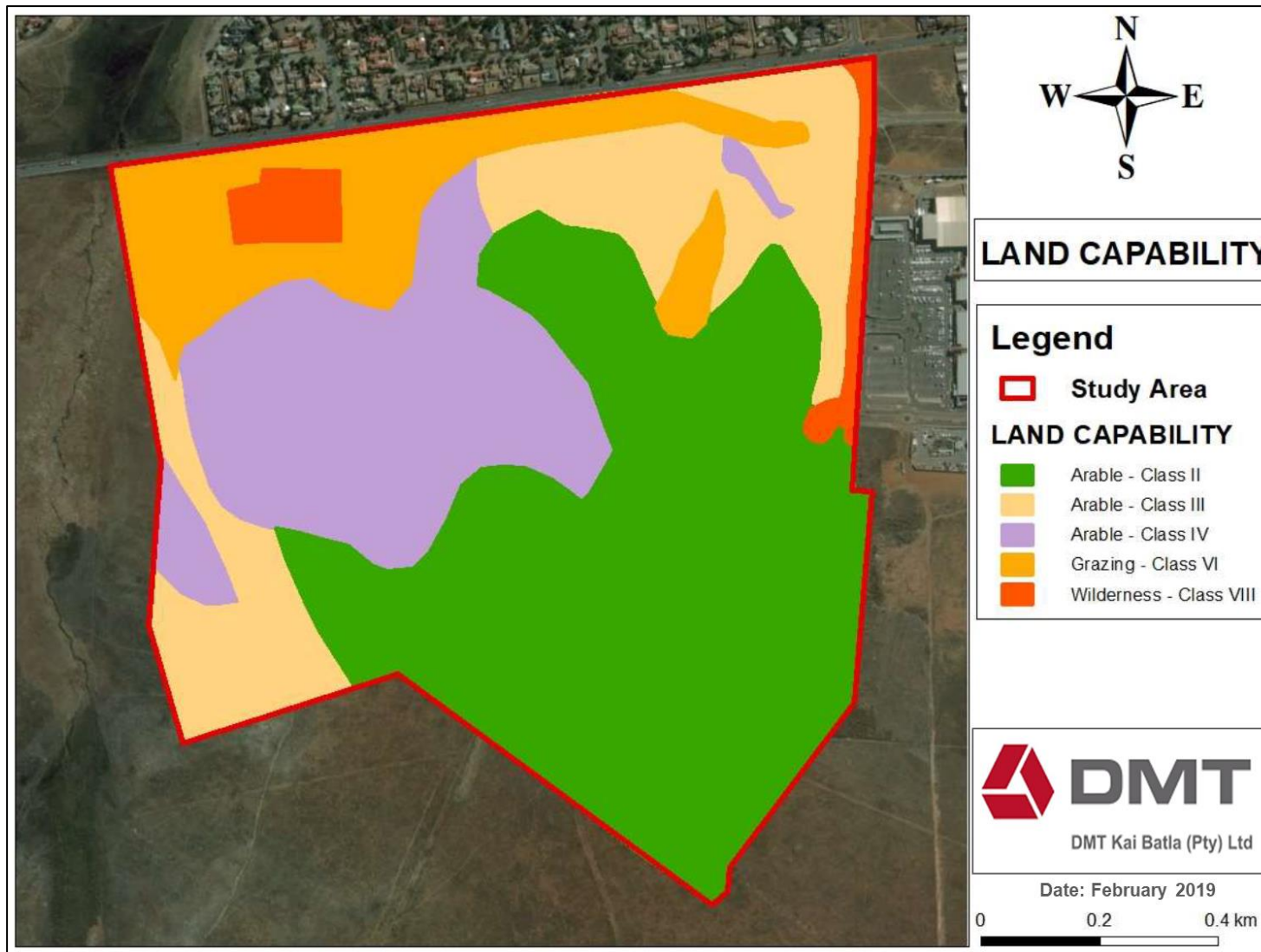



Figure 6: Land capability map depicting land capability classification of the identified soils in the study area.

**Table 3: Summary discussion of the identified Arable - Class II soil forms and their inherent agricultural land capability.**



|   |   |   |
|---|---|---|
| <b>Soil Form(s)</b>                     | Hutton and Clovelly soil forms  |  <p><b>View of the landscape morphology characteristics</b></p>  <p><b>View of the characteristic features of the identified Hutton and Clovelly soil forms.</b></p> |
| <b>Terrain Morphological Unit (TMU)</b> | Relatively flat landscape of < 1% slope gradient  |   |
| <b>Areal Extent</b>                     | Approximately 48.5 ha; which constitutes ≈ 42.8% of the study area  |   |
| <b>Diagnostic Horizon Sequence</b>      | <p><b>Hutton</b><br/> A horizon: Orthic (0 - 12 cm)<br/> B horizon: Red apedal (12 - 100 cm)<br/> ≥ 100 cm: <i>unspecified material</i></p> <p><b>Clovelly</b><br/> A horizon: Orthic (0 - 34 cm)<br/> B horizon: Yellow brown apedal (34 - 100 cm)<br/> ≥ 100 cm: <i>unspecified material</i></p>  |   |
| <b>Physical Limitations</b>             | The Hutton and Clovelly soil forms have sufficient depth for most cultivated crops and good drainage characteristics. These soils are inherently ideal for crop cultivation.  |   |
| <b>Land Capability</b>                  | <p>The identified Hutton and Clovelly soil forms are considered to be prime agricultural soils of high (class II) land capability, suitable to arable agricultural land use.</p> <p>These soils are therefore considered to contribute significantly to provincial and/or national agricultural productivity if used for crop cultivation, and are essentially also well-suited for other less intensive land uses such as grazing, forestry, etc. However, emphasis is directed to their agricultural crop productivity due to the scarcity of such soil resources on a national scale and food security concerns.</p> |   |

**Table 4: Summary discussion of the Arable – Class III soil forms and their inherent agricultural land capability.**



|                                    |  |  |
|------------------------------------|--|--|
| <b>Soil Type(s)</b>                | Glencoe 01 and Fernwood soil forms   |  <p><b>View of the identified diagnostic features of the Glencoe and Fernwood soil forms.</b></p> |
| <b>Terrain Morphology</b>          | Gently sloping landscape of 3-5% slope gradient  |  |
| <b>Areal Extent</b>                | Approximately 20.4 ha; which constitutes $\approx$ 18% of the study area   |  |
| <b>Diagnostic Horizon Sequence</b> | <p><b><u>Glencoe</u></b><br/> <b>A horizon:</b> 0 - 18 cm: Orthic A<br/> <b>B1 horizon:</b> 18 – 65 cm: Yellow-brown apedal B<br/> <b>B2 horizon:</b> <math>\geq</math> 54 cm: Weathered Hard plinthic B (bedrock)<br/> <b><u>Fernwood</u></b><br/> <b>A horizon:</b> Orthic A (0 - 3 cm)<br/> <b>Eluvial (E):</b> bleached E (3 – 100 cm) horizon</p> |  |

|                             |   |  |
|-----------------------------|---|--|
| <b>Physical Limitations</b> | <p>The identified Glencoe and Fernwood soil forms have sufficient effective rooting depth, which can produce high crop yields for most arable crops. As such, these soils are therefore considered to be of high (Class III) land capability, suitable to arable agricultural land use.</p> <p>These soils have sufficient depth for most cultivated crops and rapid drainage characteristics. However, the excessively drained nature of Fernwood soil forms (as evidenced by the bleached E-horizon) may be problematic for cultivated crops where irrigation is not viable. This further indicates high leaching rates and poor nutrients retention to sustain arable crops.</p> |  |
|-----------------------------|---|--|


**Table 5: Summary discussion of the identified Arable - Class IV soil forms and their inherent agricultural land capability.**

|   |   |   |
|---|---|---|
| <b>Soil Form(s)</b>                     | Glencoe 02, Avalon and Wasbank soil forms   |  <p><b>View of gently sloping landscape</b></p>  <p><b>View of the characteristic features of the identified Glencoe, Avalon, and Wasbank soil form.</b></p> |
| <b>Terrain Morphological Unit (TMU)</b> | Gently sloping landscape of 1.5-3 % slope gradient  |   |
| <b>Areal Extent</b>                     | Approximately 25.6 ha; which constitutes $\approx$ 22.6% of the study area  |   |
| <b>Diagnostic Horizon Sequence</b>      | <p><b>Glencoe</b><br/> A horizon: Orthic (0 - 18 cm)<br/> B1 horizon: Yellow-brown apedal (18 – 34 cm)<br/> B2 horizon: <i>hard plinthite</i> (<math>\geq</math> 34 cm)</p> <p><b>Avalon</b><br/> A horizon: Orthic (0 - 21 cm)<br/> B1 horizon: Yellow-brown apedal (21 – 52 cm)<br/> B2 horizon: Soft Plinthic (<math>\geq</math> 52 cm)</p> <p><b>Wasbank</b><br/> A horizon: Orthic (0 - 21 cm)<br/> E horizon: Bleached E (21 – 44 cm)<br/> B horizon: Hard plinthic B (<math>\geq</math> 44 cm)</p> |   |
| <b>Physical Limitations</b>             | The occurrence of the massively indurated hard plinthite at relatively shallow depth is the primary land capability limitation of the Glencoe soil form as this horizon cannot be cut with a spade even when wet. Whereas, seasonal waterlogging is the main limitation for the Avalon and Wasbank soil forms.  |   |
| <b>Land Capability</b>                  | The identified Glencoe 02, Avalon, and Wasbank soil forms are considered to be of moderate (class IV) land capability, and are marginally suitable for arable agricultural land use. These soils are therefore considered to make a moderate contribution to agricultural productivity on a regional and national scale.  |   |

**Table 6: Summary discussion of the Grazing – Class VI soil forms and their inherent agricultural land capability.**

|   |  |  |
|---|--|--|
| <b>Soil Form(s)</b>                     | Dresden soil form  |  <p><b>Landscape features for the Dresden soil form</b></p>  <p><b>View of the identified Dresden soil forms.</b></p> |
| <b>Terrain Morphological Unit (TMU)</b> | Gently sloping landscape of 3 - 5% slope gradient  |  |
| <b>Areal Extent</b>                     | Approximately 15.6 ha; which constitutes $\approx 13.8\%$ of the study area  |  |
| <b>Diagnostic Horizon Sequence</b>      | A horizon: Orthic (0 - 27 cm)<br>B horizon: Hard plithicB ( $\geq 27$ cm)  |  |
| <b>Physical Limitations</b>             | Shallow effective rooting depth is the primary limitation of the land capability of the Dresden soil forms, which is due to the occurrence of the massively indurated hard plinthite at shallow depth. The hard plinthite horizon is massively cemented such that it cannot be cut with a spade even when wet, and hinders penetration of plant roots  |  |
| <b>Land Capability</b>                  | The identified Dresden soil forms are considered to be of poor (class VI) land capability, and are not suitable for arable agricultural land use. These soils are at best suitable for natural pastures for light livestock grazing. Therefore, these soils are considered to make a substantial contribution to subsistence farming on a local scale. |  |

**Table 7: Summary discussion of the Witbank soil form and their inherent agricultural land capability**

|   |  |  |
|---|--|--|
| <b>Soil Form(s)</b>                     | Witbank soil forms ( <i>Anthrosols</i> )   |  |
| <b>Terrain Morphological Unit (TMU)</b> | Gently sloping landscape of 1 - 3% slope gradient  |  |
| <b>Areal Extent</b>                     | Approximately 3.2 ha; which constitutes $\approx$ 2.8% of the study area   |  |
| <b>Diagnostic Horizon Sequence</b>      | Unspecified – diagnostic (classifiable) soil material could not be assessed as the <i>in-situ</i> soil is buried and/or extensively modified at the time of assessment.  |  |
| <b>Physical Limitations</b>             | Comprises of extensively disturbed areas due to historic anthropogenic activities, to an extent that no recognisable diagnostic soil horizon properties could be identified. These soils primarily included developed areas such as the electrical substation building and associated infrastructure, and concrete paving on road surfaces identified within the study area. |  |
| <b>Land Capability</b>                  | These soils were classified as Wilderness (Class VIII) and are not considered to make a significant contribution to agricultural productivity under current conditions.  | View of the observed infrastructure classified as the Witbank soil forms             |

#### 4. PRELIMINARY CONCLUSIONS

No agricultural land use activities were identified in the vicinity of the study area during the soil survey. The majority of the study area comprised of natural grassland, surrounded by commercial and residential properties along the eastern and northern boundaries, respectively. Industrial activities were also identified in the vicinity of the study area, including three mining dumps (marked within red circles below) located within a 5km radius from the eastern boundary of the study area, and a small electrical substation located within the north-western portion of the study area.

The majority of the study area comprised of the Glencoe and Hutton soil forms, constituting approximately 35.5 % (40.2 ha) and 31.8% (36 ha) of the study area, respectively. Clovelly and Dresden soil forms were also identified, comprising approximately 11% (12.5 ha) and 13.8% (15.6 ha) of the study area. Whereas the remainder of the study area was occupied by the Wasbank, Fernwood, and Witbank soil forms.

The Witbank soil form comprises of developed areas such that the underlying soil could not be accessed for classification, which were then classified as Witbank soil forms by default. The Witbank soil form is characteristic of the soils that have been extensively modified or buried by historic anthropogenic activities, hence appropriate in this scenario. The areas where the Dresden soil forms were identified appeared to be somewhat transformed, as the hard plinthite layer was exposed to the surface in some of these areas. This likely due to historic anthropogenic activities, such as borrow pits, which is very common in this region.

#### 5. PLAN FOR THE EIA IMPACT ASSESSMENT

The identified impacts will be assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of sensitive receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change.

The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructures that are possessed by an organisation.
- **Impact (environmental)** refers to the consequences of the proposed development activities on environmental resources and/or receptors.

- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as soils, wetlands, and water features where applicable.
- **Resources** include components of the biophysical environment.
- **Sensitivity** refers to the susceptibility of the receptor or resource to the anticipated impact caused by the development activities.
- **Intensity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria, as illustrated under **Table 3** below. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The probability of the impact and the sensitivity of the receptor(s) together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. Whereas, the extent, intensity, and duration of the impact together comprise the consequence of the impact, also adding up to a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix (**Table 4**) to determine the significance of the impact and necessary mitigation requirements. The impact significance is calculated using the following formula:

$$\text{Significance} = (\text{Probability} + \text{Resource/ Receptor Sensitivity}) \times (\text{Extent} + \text{Intensity} + \text{Duration})$$

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

**Table 8: Impact assessment criteria and description**

|   | Descriptor                | Description   | Rating |
|---|---------------------------|---|--------|
| <b>Probability</b>                            | Unlikely                  | Impact is unlikely to occur for the proposed activity   | 1      |
|   | Possible                  | Impact may occur  | 2      |
|   | Likely                    | The nature of the activity commonly triggers the impact   | 3      |
|   | Highly likely             | The activity will almost certainly trigger the impact   | 4      |
|   | Inevitable                | The impact will most definitely occur   | 5      |
| <b>Resource/<br/>Receptor<br/>Sensitivity</b> | Negligible                | Receptor(s) not sensitive to the impact   | 1      |
|   | Low                       | Receptor(s) significantly resistant against impact  | 2      |
|   | Moderate                  | Receptor(s) moderately sensitive to impact  | 3      |
|   | Moderately<br>High        | Receptor(s) vulnerable to impact  | 4      |
|   | Very High                 | Receptor(s) highly susceptible to impact  | 5      |
| <b>Extent</b>                                 | Local/Site                | Impact limited within the vicinity of the development area<br>(≤ 5km from site)                                       | 1      |
|   | Regional                  | Includes the surrounding area, within 100km and/or ≤ 250 ha   | 2      |
|   | National                  | Extends >100km and/or ≥250 ha   | 3      |
| <b>Intensity</b>                              | Low                       | Natural processes or functions are not affected.  | 1      |
|   | Moderate                  | Affected environment is altered but function and process continue in a modified manner                                | 2      |
|   | High                      | Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases | 3      |
| <b>Duration</b>                               | Temporary<br>(short term) | Dissipation of impact through active or natural mitigation in a time span shorter than 5 years                        | 1      |
|   | Medium term               | Will most likely last for 5–10 years, and can be effectively mitigated thereafter.                                    | 2      |
|   | Long term                 | The impact will last for the entire operational life of the operation, but will be mitigated thereafter               | 3      |
|   | Permanent                 | Non-transitory.   | 4      |

**Table 9: Significance Rating Matrix**

| LIKELIHOOD (Likelihood + Sensitivity) | CONSEQUENCE (Extent + Intensity + Duration) |    |    |    |    |    |    |    |    |     |
|---------------------------------------|---|----|----|----|----|----|----|----|----|-----|
|                                       | 1   | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
|                                       | 2   | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 18 | 20  |
|                                       | 3   | 6  | 9  | 12 | 15 | 18 | 21 | 24 | 27 | 30  |
|                                       | 4   | 8  | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40  |
|                                       | 5   | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50  |
|                                       | 6   | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60  |
|                                       | 7   | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70  |
|                                       | 8   | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80  |
|                                       | 9   | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90  |
|                                       | 10  | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

**Table 10: Criteria for assessing the significance of impacts**

|                     |                 |                                   |          |
|---------------------|-----------------|-----------------------------------|----------|
| <b>Significance</b> | Low             | Site specific, low intensity      | 1 - 25   |
|                     | Medium          | Site specific, moderate intensity | 26 - 50  |
|                     | Moderately High | Site specific, high intensity     | 51 - 75  |
|                     | Very High       | Regional, high intensity          | 75 - 100 |

**Table 11: Mitigation Requirements.**

| Significance Level | Significance Rating | Negative Impact Management Recommendation  |
|--------------------|---------------------|--|
| Very High          | 76 - 100            | Critically consider the viability of proposed projects.<br>Improve current management of existing projects significantly and immediately.                              |
| Moderately High    | 51 - 75             | Comprehensively consider the viability of proposed projects.<br>Improve current management of existing projects significantly and seek mechanisms to minimise impacts. |
| Medium             | 26 - 50             | Maintain current project layout and methodology, with recommended management practices to alleviate the identified impacts.  |
| Low                | 1 - 25              | Maintain current project layout and methodology, with recommended management practices to alleviate the impacts.   |

## 6. REFERENCES

- Agricultural Geo-Referenced Information System (AGIS) database. [www.agis.agric.za](http://www.agis.agric.za).
- Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983).
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- Department of Mines (1970). 1:250 000 Geological Map Series (sheet no. 2730) of the Republic of South Africa (RSA) and the Kingdoms of Lesotho and Swaziland. Department of Mines (1970).
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- Soil Classification Working Group, 1991. Soil classification. A taxonomic system for South Africa. Mem. agric. nat. Resour. S. Afr. No. 15. Dept. Agric. Dev., Pretoria.

## **APPENDICES**

## APPENDIX A: DETAILS, EXPERTISE AND CURRICULUM VITAE OF THE SPECIALIST

### 1.(a)(i) Details of the specialist who prepared the report

**Ms. Sinethemba E. Mchunu**

SACNASP: 100171/13

M.Sc. Soil Science (US)

BSc. Hons (Soil Science) (US)



Sinethemba E. Mchunu

### 1.(a).(ii) The expertise of the specialist who compile a specialist report including a curriculum vitae

|                             |  |
|-----------------------------|--|
| Company of Specialist:      | DMT Kai Batla (Pty)Ltd (Associate)   |
| Name                        | Sinethemba Mchunu  |
| Contact Number:             | +27 71 974 0651  |
| Qualifications              | MSc. Soil Science (University of Stellenbosch)<br>BSc Hons. Soil Science (University of Stellenbosch)<br>BSc. Agric. Viticulture & Soil Science (University of Stellenbosch)   |
| Registration / Associations | South African Council for Natural Scientific Professions (SACNASP)<br>Member of the Land Rehabilitation Society of Southern Africa (LaRSSA)<br>Member of the Soil Science Society of South Africa (SSSSA)<br>Member of the South African Soil Surveyors Association (SASSO)<br>Member of the Gauteng Wetland Forum (GWF) |

**COMPETENT PERSON'S CERTIFICATE  
(World Bank Format)**

**Position:** Soil Specialist

**Name:** Sinethemba Euginia Mchunu

**Profession:** Environmental Science

**Date of birth:** 1988

**Nationality:** South African

**Membership in Professional Societies:**

| Professional Society   |
|--|
| ▪ South African Council for Natural Scientific Professions (SACNASP): <b>Reg. No.: 100171/13</b> |
| ▪ Land Rehabilitation Society of Southern Africa (LaRSSA)  |
| ▪ Soil Science Society of South Africa (SSSSA)   |
| ▪ South African Soil Surveyors Organization (SASSO)  |

**Education:**

| Degree/Diploma  | Institution                | Year |
|---|----------------------------|------|
| MSc. Soil Science   | University of Stellenbosch | 2012 |
| BSc. Hons. Soil Science   | University of Stellenbosch | 2010 |
| BSc. Agric. Viticulture and Soil science<br>Postgraduate Biometry (Statistics) course | University of Stellenbosch | 2009 |

**Certification:**

- 2014: Visual and Verbal Communication skills
- 2014: Level 1 First Aid Certificate by National First Aid Academy (NFAA);
- 2013: Candidate Natural Scientist Certificate (Reg. No.: 100171/13) by South African Council for Natural Scientific Professions (SACNASP);
- 2013: Land Rehabilitation Certificate by Land Rehabilitation Society of the Southern Africa (LaRSSA);
- 2013: Pro-Active Defensive Driving Certificate by Titan Medical;
- 2012: Acid Mine Drainage Certificate by Aminergy;
- 2012: Introduction to Practical Implementation of Environmental Law by Imbewu Sustainability Legal Specialists (Pty) Ltd;
- 2011: Certificate in solid state <sup>13</sup>C NMR Spectroscopy;
- 2010: Certificate in Scientific writing, by the Writing Lab, Stellenbosch University;
- 2008: Certificate in Integrated Production of Wine (IPW); and 2006: Certificate in South African Wine Course, Cape Wine Academy.

***\*Transcripts and certificates can be made available on request.***

**Employment Record and Responsibilities:**

| Position  | Company   | Job description  |
|---|---|--|
| Associate   | DMT Kai Batla   | <ul style="list-style-type: none"> <li>Provision of soil specialist and pedology services.</li> </ul>  |
| Founder & Director                                | Nhloso Land Resources (Pty) Ltd                       | <ul style="list-style-type: none"> <li>Conduct Soil Classification Surveys and facilitate soil mapping for Land Use and Agricultural Land Capability assessment projects</li> <li>Assess contaminated land according to NEMWA Act 59 of 2008 regulations for operational and/or abandoned industrial sites;</li> <li>Conducted water quality monitoring assessments and interpretation of analytical data according to various purposes e.g. drinking, domestic use, etc.;</li> <li>Soil and water sampling, monitoring, data analysis and interpretation of various chemical composition including heavy metals, TPH, and VOCs etc.;</li> <li>Waste Classification according to NEMWA Act 59 of 2008 to inform waste management and disposal requirements;</li> <li>Conduct specialised hydropedological investigations to assess development impact on wetland systems;</li> <li>Conduct Environmental Risks Assessments, entailing environmental risk profiling and detailed hydrocensus</li> <li>Compile Integrated Environmental Risk Assessment reports from various specialists' inputs; and</li> <li>Facilitate project progress updates, presentations, client and stakeholder liaison on active projects.</li> </ul> |
| Senior Environmental Consultant (Project Manager) | Scientific Aquatic Services                           | <ul style="list-style-type: none"> <li>Project administration and budget allocation to junior consultants;</li> <li>Preparation of technical proposals for tenders, and coordinate field visits and equipment inventories;</li> <li>Liaison with clients, project engineers, landowners, and regulating authorities;</li> <li>Project execution and field data collection, including data formatting, analysis, interpretation thereof;</li> <li>Conceptual graphic illustrations using the ArcGIS mapping software and preparation of AutoCAD layout drawings;</li> <li>Assessment report compilation and technical review; and</li> <li>Facilitate oral presentations during client feedback meetings and stakeholder engagement.</li> </ul>   |
| Contaminated Site Consultant (Project Manager)    | Environmental Resources Management (ERM) South Africa | <ul style="list-style-type: none"> <li>Perform Project Manager duties such as writing proposals, invoicing, client meetings, liaison with external contractors and in-house subcontractors, facilitate team briefings etc.;</li> <li>Conduct underground storage tank (UST) Decommissioning Assessments at retail and commercial sites in Gauteng and Free State. Responsibilities</li> </ul>  |

|                        |   |  |
|------------------------|---|--|
|                        |   | <p>included soil assessment and sampling, and soil analytical data interpretation for waste classification according to National Environmental Management Waste Act (NEMWA) Act 59 of 2008; and risk assessment for human and environmental receptors;</p> <ul style="list-style-type: none"> <li>▪ Evaluate contractors and subcontractors compliance with the site specific EMP requirements and general safety procedures on site;</li> <li>▪ Conduct Environmental Risks Assessments, entailing environmental risk profiling and detailed hydrocensus;</li> <li>▪ Advise clients on management of contaminated soil and/or groundwater if encountered;</li> <li>▪ Compile UST decommissioning reports, Groundwater Monitoring reports, and Environmental Risks Assessments reports; which entail evaluating various risk exposure pathways from contaminated media ("source" e.g. soil, groundwater etc.) to sensitive receptors including humans and environment; and</li> <li>▪ Perform quality assessment/quality control (QAQC) for various reports from fellow colleagues before submission for Partner Review.</li> </ul>  |
| <b>Soil Specialist</b> | Strategic Environmental Focus (Pty) Ltd | <ul style="list-style-type: none"> <li>▪ Conducted independent soil contamination assessments, which entails site investigation, sampling, interpretation of analytical data from the Laboratory, and report compilation;</li> <li>▪ Conducted water quality monitoring assessments and interpretation of analytical data according to various purposes e.g. drinking, domestic use, etc.;</li> <li>▪ Data interpretation of various chemical composition of soil, water and/or other composite waste for Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds (VOCs), heavy metals, and other routine parameters such as pH, Electrical Conductivity (EC) etc.;</li> <li>▪ Compilation of specialist reports for various soil contamination assessments and support Report quality control for junior staff, including dust monitoring and water quality assessment reports;</li> <li>▪ Assemble and integrate data and information across various disciplines, e.g. compilation of Risk and Liability Assessment reports from various specialist studies; including Wetland, Flora, Fauna, Hydrology etc.;</li> <li>▪ Soil classification according to the Taxonomic System for South Africa (Soil Classification Working Group, 1991) and soil mapping;</li> <li>▪ Evaluation of Land Capability and Agricultural Potential for various Basic Assessments (BAs) and Environmental Impact Assessments (EIAs);</li> <li>▪ Compute soil Erosion Management Plan (EMP) for various Land Use developments;</li> <li>▪ Facilitate Water Use License Applications and liaison with relevant authorities at the Department of Water Affairs (DWA); and</li> </ul> |

|                                   |                         |  |
|-----------------------------------|-------------------------|--|
|                                   |                         | <ul style="list-style-type: none"> <li>▪ Liaison with various clients and subcontractors, and regulating authorities.</li> </ul>   |
| <b>Soil Analytical Researcher</b> | Stellenbosch University | <ul style="list-style-type: none"> <li>▪ Soil classification according to the Taxonomic System for South Africa (Soil Classification Working Group, 1991);</li> <li>▪ Soil organic matter analyses with solid state <sup>13</sup>C Nuclear Magnetic Resonance (NMR) spectroscopy to evaluate its chemical composition and determine organic functional group components;</li> <li>▪ Soil and organic matter analyses with Fourier Transform Infrared (FT-IR), and Diffraction Scanning Calorimeter (DSC) as well as Thermo-Gravimetric Analysis (TGA) thermal analyses for the determination of thermal resistance of organic matter derived from various vegetation sources;</li> <li>▪ Monitoring soil water status using a radioactive probe and pressure bomb for irrigation scheduling, winter pruning, establishment (planting) of new vineyard and olive orchard blocks, and preparation of fertilizer and pesticide solutions; and</li> <li>▪ Cover Crop Management in vineyards and orchards at the Nietvoorbij-Infruitec Agricultural Research Council (ARC).</li> </ul> |

#### Languages:

English: Excellent

IsiZulu: Excellent

Xhosa: Excellent

Afrikaans: Basic understanding

#### 1.(b) A declaration that the specialist is independent in a form as may be specified by the competent authority

I, Sinethemba Mchunu, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;

- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



**Sinethemba Euginia Mchunu**

Date: **28 February 2018**

DRAFT