# SOIL, LAND USE, AND LAND CAPABILITY (AGRICULTURE IMPACT) SITE SENSITIVITY VERIFIACTION/ASSESSMENT: FOR THE DEVELOPMENT OF RENEWSTABLE ®SIVUTSE ON THE FARM BERGVLIET 65HS AND REMAINING EXTENT OF THE FARM RIETFONTEIN 66HS, WITHIN THE DR PIXLEY KA ISAKA SEME LOCAL MUNICIPALITY IN THE MPUMALANGA PROVINCE

REF: AGR_HDF SIVUTSE_23

DATE:

12 SEPTEMBER 2024

PREPARED FOR

RENEWSTABLE MPUMALANGA

PREPARED BY

NSOVO ENVIRONMENTAL CONSULTING

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DOCUMENT CONTROL

| | |
|---|---|
| Report Name | Soil, Land Use, And Land Capability (Agriculture Impact) Assessment: For the Proposed Renewstable Power Plant Sivutse within portions 4 and 5 of the farm Rietfontein 66-HS in the province of Mpumalanga, South Africa |
| Reference | AGR_HDF SIVUTSE_23 |
| Version | Final Draft |
| Submitted to | HDF Energy Pty Ltd |
| Author | Tshiamo Setsipane (*Pr. Nat. Sci* 114882) |
| Reviewer | Rejoice Aphane |
| Date Produced | 12 September 2024 |

# EXECUTIVE SUMMARY

As part of the Eskom land tender MWP1247GX, Hydrogene de France (HDF- Energy) has been awarded 1782 ha of Eskom's land to develop 8 Renewstable® hydrogen power plants in the Mpumalanga Province, South Africa. Distributed over five farm portions near the Tutuka and Majuba Coal Power Stations, HDF-Energy is part of a cluster of different project developers, also awarded with land in the area to develop infrastructure related to renewable energy. HDF-Energy, under its Special Purpose Company (SPC) "Renewstable Mpumalanga (Pty) Ltd", is undertaking the development and implementation of 4 projects referred to as Majuba Cluster that consists of the following:

- Renewstable® Ntokozo
- Renewstable® Bokamoso
- **Renewstable®Sivutse**
- Renewstable® Qhakaza

These projects are high-capacity renewable power plant based on hydrogen BESS storage technology that harnesses renewable energy from a Photovoltaic (PV) Park and converts it into hydrogen using an electrolyser system. This ESIA is specifically for the proposed Renewstable®Sivutse near Amersfoort within Portions 1, 6, 34 and the Remaining Extent of the Farm Bergvliet 65HS as well as the Remaining Extent of the Farm Rietfontein 66HS, approximately 3 km northeast of Majuba Power Station and approximately 7 km southwest of Amersfoort in the province of Mpumalanga, South Africa (henceforth referred to as study area). The site is approximately 435 ha.

The study area is within a subtropical highland climate or Monsoon-influenced temperate oceanic climate. This climate is characterized by cold, dry winters and warm, wet summers. The summers experience heavy precipitation due to unstable, humid air masses that encourage thunderstorm development. The mean annual rainfall ranges between 601-800 mm, sufficient to support rainfed agriculture. However, it is important to carefully consider the planting dates and the length of the growing season, as they may be affected.

Based on the observations during the site assessment, the dominant soils occurring within the study area are Mispah/Glenrosa, Grabouw, Swartland, Katspruit, Dundee, Willowbrook and Witbank. The majority of the soils occurring within the study area do not meet the conditions for agricultural suitability to a certain extent, and these conditions include:

1. Adequate depth (greater than 60 cm) to accommodate root development for the majority of cultivated crops;
2. Good structure, as in water-stable aggregates, which allows for root penetration and water retention;
3. Sufficient distribution of high-quality and potential soils within the study area to constitute a viable economic management unit and
4. Good climatic conditions, such as sufficient rainfall and sunlight, increase crop variety.

However, based on site observations, the soils were tilled to break the plough layer to make them more productive.

Tables A and B below depict the summary findings of the soils identified within the study area and their respective land capability and agricultural potential status.

Table A: Summary findings within the study area.

| Renewstable Sivutse Study Area | | | | |
|---|---|---|---|---|
| Soil Forms | Area (Ha) | Percentage (%) | Land Capability Class – According to (Smith, 2006) | Agricultural Potential |
| Grabouw | 128.70 | 27.6 | Arable (Class IV) | Moderate |
| Swartland | 49.20 | 10.6 | | |
| Katspruit | 13.18 | 2.8 | Watercourse (Class V) | Very Low |
| Willowbrook | 1.42 | 0.3 | | |
| Dundee | 0.40 | 0.1 | | |
| Mispah/Glenrosa | 264.43 | 56.8 | Grazing (Class VI) | Low |
| Witbank | 0.82 | 0.2 | Wilderness (Class VIII) | Very Low |
| Infrastructure | 7.61 | 1.6 | - | - |
| **Total Enclosed** | **332.77** | **100** | | |

Table B: Land capability (DAFF, 2016) associated with the soils occurring within the study area.

| Soil Form | Land Capability Groups | DAFF (2017) Classification |
|---|---|---|
| Grabouw | Arable Land | 8. Moderate |
| Swartland | | |
| Katspruit | Watercourse | 5. Low |
| Willowbrook | | |
| Dundee | | |
| Mispah/Glenrosa | Grazing Land | 6. Low - Moderate |
| Witbank | Wilderness/Disturbed | 2. Very Low |

The active pastures within the study area are critical for livestock farming and are important from an agricultural standpoint. According to the desk-based assessment (i.e., sourced from the Natural Agricultural Resource Atlas of South Africa database), the grazing capacity for this area is 4 Hectares per livestock unit, which is considered adequate for large-scale farming. Also, the transformation of the shallower soils identified in the study area into maize cultivation and can also be considered critical from an agricultural viewpoint. As such, this presents a constraint for this project.

In spite of the fact that agricultural soils will be lost and land will be temporarily altered (for the duration of the lifespan of the project) within the study area, the cumulative loss of agricultural resources at local and regional levels will be moderate without mitigation, while moderately low with mitigation. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of grazing land since it is the dominant land use within the study area. As a result, integrated mitigation measures must be implemented to minimize potential soil losses, considering the need for sustainable development. Mixed land use, such as cattle grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy. That said, for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a minimal loss of agricultural land on a site such as the one being assessed, which has marginal cultivation potential based on inherent soil properties, than to lose agricultural land that has a higher potential and that is much scarcer, to renewable energy development elsewhere in the country.

In accordance with the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, 1998, when applying for environmental authorisation the current use of the land and the environmental sensitivity of the site under consideration as identified by the national web-based environmental screening tool, must be confirmed by undertaking a site sensitivity verification.

The outcome of this site sensitivity verification is to:

- Confirm or dispute the current use of the land and the environmental sensitivity as identified by the screening tool; and
- Motivate and provide evidence of either the verified or different use of the land and environmental sensitivity of the site.

The screening tool analysis was conducted, which presented the findings as the impact on agricultural resources being of high sensitivity in terms of agricultural sensitivity. Based on the outcomes of the field assessment, this was found to be of a moderately significant impact due to the dominant soil forms, which are not high-potential agricultural soils due to various limitations, including shallower depth and requiring intensive management strategies to cultivate. The land capability of the surrounding soils and the agricultural potential are very low to moderate due to adequate climatic conditions (i.e., rainfall, temperature) and appropriate slope, which allows for intensive commercial agricultural practices. The allocated sensitivities for the agricultural theme are presented on Table C below.

Table C: Summary of the screening tool vs specialist-assigned sensitivities.

| SITE SENSITIVITY VERIFICATION | | | |
|---|---|---|---|
| | Screening Tool | | Site Verification Outcome |
| Renewstable Sivutse Study Area | High Sensitivity | | Moderate Sensitivity |

It is the opinion of the specialist that this study provides the relevant information required for the Environmental Impact Assessment phase of the project to ensure that appropriate consideration of the agricultural resources in the study area is made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

# DECLARATION OF INDEPENDENCE

- I, Tshiamo Setsipane, in my capacity as a specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to HDF Energy Pty Ltd for this project.
- Do not have any personal, business, or financial interest in the project except for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2014, as amended.
- Will not be affected by the outcome of the environmental process, of which this report forms part.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments but aim to present facts and my best scientific and professional opinion about the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Environmental Impact Assessment Regulations, 2014, as amended.

Tshiamo Setsipane

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(Pr. Nat. Sci 114882)

12 August 2024

DOCUMENT GUIDE

This report was compiled according to the following information guidelines for a specialist report in terms of the Environmental Impact Assessment (EIA) Sections 24(5)(a) And (h) and 44 of The National Environmental Management (NEMA), Act 1998, as summarised on the Table below.

Table A: Document guide according to Regulation (No. R. 982) as amended.

Theme-Specific Requirements as per Government Notice No. 320Agricultural Resources Theme – Very High and High Sensitivity Rating as per Screening Tool Output

| No. | NEMA Regs (2014)- Appendix 6 | The relevant section in the report |
|---|---|---|
| 2 | Agricultural Agro-Ecosystem Specialist Assessment | |
| 2.1 | The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professionals (SACNASP). | CV Attached |
| 2.2 | The assessment must be undertaken on the preferred site and within the proposed development footprint. | Section 1.1 |
| **2.3** | **The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within the past 5 years, and must identify:** | |
| 2.3.1 | the extent of the impact of the proposed development on the agricultural resources and | Section 4 |
| 2.3.2 | whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event it does, whether the positive impact of the proposed development on agricultural resources outweighs such a negative impact. | Section 5.4 |
| **2.4** | **The status quo of the site must be described, including the following aspects, which must be considered as a minimum in the baseline description of the agro-ecosystem:** | |
| 2.4.1 | the soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit, and slope; | Section 4 |
| 2.4.2 | where applicable, the vegetation composition, available water sources, as agro-climatic information; | |
| 2.4.3 | the current productivity of the land-based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units; | Section 5.5 |

| | | |
|---|---|---|
| 2.4.4 | the current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure and | Section 1.6 |
| 2.4.5 | existing impacts on the site, located on a map (e.g., erosion, alien vegetation, non-agricultural infrastructure, waste, etc.). | Section 4.1 |
| **2.5** | **Assessment of impacts, including the following aspects which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:** | |
| 2.5.1 | change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down into production units; | Section 5.5 |
| 2.5.2 | change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure and | Section 1.6 |
| 2.5.3 | any alternative development footprints within the preferred site would be of “medium” or “low” sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification. | Section 5.4 |
| **2.6** | **The Agricultural Agro-Ecosystem Specialist Assessment findings must be written up in an Agricultural Agro-Ecosystem Specialist Report.** | |
| **2.7** | **This report must contain the findings of the agro-ecosystem specialist assessment and the following information, as a minimum:** | |
| 2.7.1 | Details and relevant experience, as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment, including a curriculum vitae; | Appendix C |
| 2.7.2 | A signed statement of independence by the specialist; | Appendix A |
| 2.7.3 | The duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment; | Section 2.2 |
| 2.7.4 | A description of the methodology used to undertake the on-site assessment, inclusive of the equipment and models used, as relevant; | Section 2 |
| 2.7.5 | A map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool; | Figure 2 |
| 2.7.6 | An indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development; | Sections 5.4 and 5.5 |

| | | |
|---|---|---|
| 2.7.7 | An indication of possible long-term benefits that the project will generate will generate in relation to the benefits of the agricultural activities on the affected land; | Section 5.4 |
| 2.7.8 | Additional environmental impacts expected from the proposed development based on the current status quo of the land, including erosion, alien vegetation, waste, etc.; | Section 4.1 |
| 2.7.9 | Information on the current agricultural activities being undertaken on adjacent land parcels; | Section 3.2 |
| 2.7.10 | An identification of any areas to be avoided, including any buffers; | N/A |
| 2.7.11 | A motivation must be provided if there were development footprints identified as per paragraph 2.5.3 above that were identified as having a “medium” or “low” agriculture sensitivity and that were not considered appropriate; | Section 5 |
| 2.7.12 | Confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro-siting of the proposed development to minimise fragmentation and disturbance of agricultural activities; | Section 5 |
| 2.7 .13 | A substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the acceptability or not of the proposed development and a recommendation on the approval or not of the proposed development; | Section 5.4 |
| 2.7.14 | Any conditions to which this statement is subjected; | Section 5.3 |
| 2.7.15 | Where identified, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and | Section 5 |
| 2.7.16 | A description of the assumptions and any uncertainties or gaps in knowledge or data. | Section 1.6 |
| **2.8** | **The Agricultural Agro-Ecosystem Specialist Assessment findings must be incorporated into the Basic Assessment Report or Environmental Impact Assessment Report, including the mitigation and monitoring measures identified, which are to be contained in the EMPr.** | |
| **2.9** | **A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.** | |

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# 1. INTRODUCTION

As part of the Eskom land tender MWP1247GX, Hydrogene de France (HDF- Energy) has been awarded 1782 ha of Eskom's land to develop 8 Renewstable® hydrogen power plants in the Mpumalanga Province, South Africa. Distributed over five farm portions near the Tutuka and Majuba Coal Power Stations, HDF-Energy is part of a cluster of different project developers, also awarded with land in the area to develop infrastructure related to renewable energy. HDF-Energy, under its Special Purpose Company (SPC) "Renewstable Mpumalanga (Pty) Ltd", is undertaking the development and implementation of 4 projects referred to as Majuba Cluster that consists of the following:

- Renewstable® Ntokozo
- Renewstable® Bokamoso
- **Renewstable®Sivutse**
- Renewstable® Qhakaza

Nsovo Environmental Consulting was appointed by HDF-Energy (Pty) Ltd (HDF) to conduct the soil, land use and land capability study as part of the Environmental Impact Assessment (EIA) process for the proposed Renewstable power plants and associated infrastructure.

The proposed project is located outside an urban area on Portions 1, 6, 34, and the Remaining Extent of the Farm Bergvliet 65HS and the Remaining Extent of the Farm Rietfontein 66HS, approximately 3 km northeast of Majuba Power Station and approximately 7 km southwest of Amersfoort. The site is within Ward 8 in the Dr Pixley Ka Isaka Seme Local Municipality jurisdiction in the Mpumalanga Province under the Gert Sibande District Municipality.

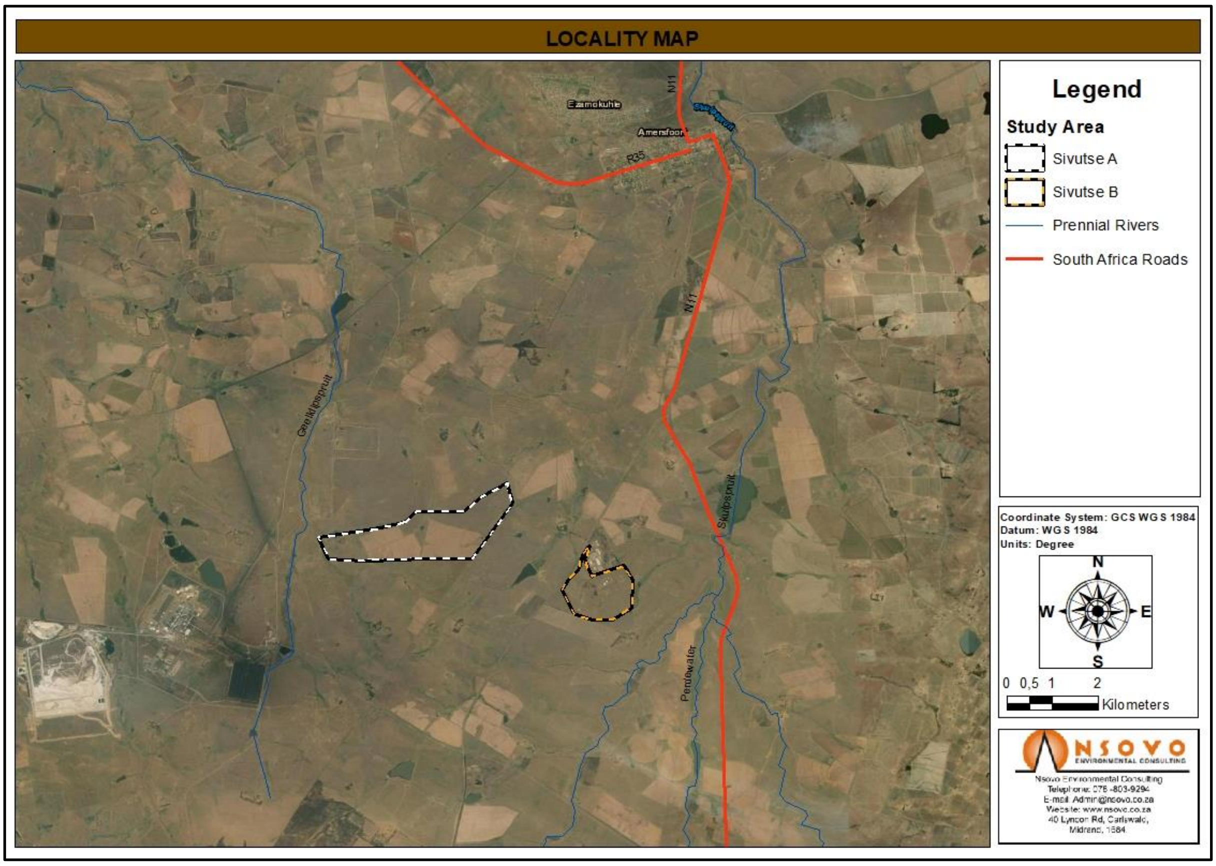


Figure 1: Locality of the study area in relation to the surrounding areas.

## 1.1 PROJECT DESCRIPTION

HDF-Energy proposes the development the 74MW Renewstable Sivutse Power Plant, a high-capacity renewable power plant based on hydrogen BESS storage technology that harnesses renewable energy from a Photovoltaic (PV) Park and converts it into hydrogen using an electrolyser system. This hydrogen is stored in a compressed gas form; subsequently, when the photovoltaic park generates insufficient energy, the stored hydrogen is utilised to produce electricity for the grid through a fuel cell system. This innovative approach ensures a continuous and reliable power supply even when the PV park's energy production is inadequate. The system will only emit oxygen and water vapour as by-products.

The electricity produced by the plants will be purchased by a private(s) off-taker (s) at an agreed rate under the Power Purchase Agreement (PPA) for at least 25 years from the commissioning. The power plant is scheduled to be commissioned in 2027 and will contribute to the greening of the local power grid and enhance the territory's energy independence. The proposed development entails the following primary infrastructure:

Table 1: Primary infrastructures

| Primary Infrastructure | Power produced |
|---|---|
| Baseload electricity | **55MW day, and evening 12 MW night** |
| Solar plant | 210MWp |
| Electrolyser | 60MW |
| Green H2 storage | 250MWh |
| High-capacity fuel cells | 12MW |
| Battery power | 220MW |
| Battery storage | 55MWh |
| Capacity production | 87% |
| Land required | 315 hectares |
| Electricity production | 841.09 MWh daily<br>307 000 MWh yearly |

Associated infrastructure includes the following:

- Hydrogen Power Centre
- Control Room
- Access/Service roads
- Buildings
- Fencing and Security
- Communications DC and AC cables installed underground and overhead.
- High Voltage Collector station that will be shared with other IPPS

## 1.2 Aims and Objectives of the Study

The objective of the Soil, Land Use, and Land Capability is to fulfill and align the proposed project with the requirements of the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) of South Africa. This act aims to promote the conservation of soil, water sources, vegetation and the control of weeds and invader plants by managing natural agricultural resources. Thus, the proposed study aims to determine the possible impacts of the proposed development on the soil, land use, land capability, and agricultural potential and identify areas of high sensitivity within the study area. This will be achieved by considering parameters such as soil quality, drainage, topography, climate, and water availability and providing sound input to ensure that land is used sustainably and responsibly. As such, this specialist report has assessed and considered the following:

- The soil forms occurring within the study area;
- The associated land capability and agricultural sensitivity of the soils occurring within the study area;
- Discussion of the land capability and sensitivity in terms of the soils, water availability, surrounding development, and current status of land;
- Discussion of potential and actual impacts as a result of the proposed development; and
- Provide mitigation for the impacts as part of the Environmental Management Programme (EMPr).

### 1.3 Suitability of soils for agricultural cultivation

Assessing soil suitability for agricultural cultivation rests primarily on identifying soils suited to crop production. For soils to be classified as being suitable for crop cultivation, they must have the following properties:

- Adequate depth (greater than 60 cm) to accommodate root development of cultivated crops;
- Good structure, as in water-stable aggregates, which allows for root penetration and water retention;
- Sufficient clay and organic matter to provide nutrients for growing crops;
- Sufficient distribution of high-quality and potential soils within the study area to constitute a viable economic management unit;
- Adequate clay content and deep enough water table to allow for water storage; and
- Good climatic conditions, such as sufficient rainfall and sunlight, increase crop choice variety.

### 1.4 Applicable Legislation

The most recent South African Environmental Legislation that needs to be considered for any new or expanding development with reference to assessment and management of soil and land use includes:

- The National Environmental Management Act. 1998 (Act 107 of 1998) requires that pollution and degradation of the environment be avoided, or, where it cannot be avoided, be minimised and remedied.
- The Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal.
- The Conservation of Agriculture Resources (Act 43 of 1983) requires the protection of land against soil erosion and the prevention of water logging and salinization of soils employing suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges, and watercourses is also addressed.

### 1.5 Terms of Reference

The terms of reference for this study are to fulfil the requirements of the Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998).

The study area includes land classified by the national web-based environmental screening tool on 26 June 2024 as having high sensitivity for impacts on agricultural resources. The level of agricultural assessment required in terms of the protocol (and hence in terms of NEMA) is, therefore, an Agricultural Agro-Ecosystem Specialist Assessment. The terms of reference for such an assessment, as stipulated in the protocol, are listed in the **Document Guide** with relevant section numbers of this report, which also fulfils each stipulation. **The protocol also requires that a Site Sensitivity Verification be done.**

The summarised terms of reference applicable to the Soils, Land Capability, and Land Use Study include the following:

- A review of available desktop information about the study area site and compile various maps illustrating the desktop data;
- Discussion of the relevant desktop literature;
- Conduct a soil classification survey covering the study area according to the South African Soil Classification System: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018);
- Determination of the current (baseline) soil physical, climatic conditions, and land uses, as well as the current land capabilities and agricultural sensitivity associated with the identified soil forms present in the study area;
- Identification and assessment of the potential impacts of the different project phases on the baseline soil, land use, and land capability properties as a result of the proposed development;
- Development of mitigation and management measures to minimise the negative impacts anticipated from the proposed development and
- Compile soil, land use, and land capability reports based on the field-finding data under on-site conditions.

## 1.6 Assumptions, Assumptions uncertainties, limitations, and gaps

The following assumptions, uncertainties, limitations, and gaps were applicable for the soil, land use, and land capability assessment:

- It is assumed that the infrastructure components will remain as indicated on the layout and that the activities for the construction and operation of the infrastructure are limited to that typical for a project of this nature;
- The soil survey was confined to the study area outline with consideration of various land uses outside the study area;
- During the site assessment and compilation of the report, employment figures pertaining to the study area could not be sourced,
- Soil profiles were observed using a 1.5m hand-held soil auger; thus, a description of the soil characteristics deeper than 1.5m cannot be given; and

- It can be challenging to classify soils as one specific form due to the infinite variations that exist in the soil continuum. Therefore, the classifications presented in this report are based on the "best fit" to South Africa's soil classification system.

# 2. METHODOLOGY

The assessment of the study area's agricultural potential was based on a combination of desktop studies to amass general information and site visits for status quo assessment, soil classification, and characterization, and the validation of generated information from the desktop studies.

## 2.1 Desktop Study and Literature Review

Literature review and background study were carried out before beginning the field assessment to gather the study area's predetermined soil, land use, and land capability data. The data was sourced from the Soil and Terrain(SOTER) database and the Natural Agricultural Atlas of South Africa Version 3:
(https://ndagis.nda.agric.za/portal/apps/webappviewer/index.html?id=8b72eb2a25c04660a1ab2b562f6ec0bf)

## 2.2 Site Survey

A desktop assessment was followed by a field investigation to validate the predetermined soil results obtained at the desktop level. The field survey was conducted over 3 days in October 2023, wherein soil auger tests were conducted, and soils were classified into soil forms according to the Soil Classification System: A Natural and Anthropogenic System for South Africa Soil Classification System (2018). It must be noted that the season has no bearing on the soil's morphological properties over a short-term period.

## 2.3 Land Capability Classification

A land capability class is an interpretive grouping of land units with similar potential and containing limitations or hazards for long-term intensive use of land for rainfed farming determined by the interaction of climate, soil, and terrain. It is a more general term than land suitability and is more conservation oriented (See Table 1 below). It involves consideration of:

- Varying limitations to land use pertaining to rainfed cultivation and soil properties; and
- The risks of land damage from erosion and other causes.

Eight land capability classes were employed, with potential decreases, limitations, and hazards increasing from class 1 to class 8. Classes 1 to 4 are considered arable, whereas Class 5 is considered wet-based soils or watercourses, and Classes 6 to 8 are classified as grazing, forestry, or wildlife. This system is based on the Land Capability Classification system of the United States Department of Agriculture (USDA) Soil Conservation Service by Klingelbiel and Montgomery (1961) as well as by Smith (2006).

Table 2: Soil Capability Classification (after Smith (2006).

| Land Capability Group | Land Capability Class | Intensity of Land Use | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | wildlife | Forestry | Light grazing | Moderate grazing | Intensive grazing | Light cultivation | Moderate cultivation | Intensive cultivation | Very intensive cultivation | Limitations |
| Arable | I | | | | | | | | | | There are no or few limitations. Very high arable potential. Very low erosion hazard |
| | II | | | | | | | | | | Slight limitations. High arable potential. Low erosion hazard |
| | III | | | | | | | | | | Moderate limitations. Some erosion hazards |
| | IV | | | | | | | | | | Severe limitations. Low arable potential. High erosion hazard. |
| Grazing | V | | | | | | | | | | Water course and land with wetness limitations |
| | VI | | | | | | | | | | Limitations preclude cultivation. Suitable for perennial vegetation |
| | VII | | | | | | | | | | Very severe limitations. Suitable only for natural vegetation |
| Wildlife | VIII | | | | | | | | | | Extremely severe limitations. Not suitable for grazing or afforestation. |

The updated and refined land capability ratings and database for the whole of South Africa were released by the Department of Fishery and Forestry (DAFF) in 2017. These land capability ratings were derived through a spatial evaluation modelling approach and a raster spatial data layer comprising fifteen (15) land capability evaluation values 9 (see Table 2 below). The new land capability describes the categories as 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for the production of cultivated crops. (DAFF, 2017). Soil agricultural potential is impacted by several factors (see Table 3 below). The soil agricultural potential was evaluated based on the factors mentioned and described in Table 3 by assigning qualitative criteria ratings such as High, Moderate, or Marginal to low to the updated land capability ratings.

Table 3: National Land Capability Values (DAFF, 2017).

<table>
<tr><th>Land Capability evaluation value</th><th>Land Capability Description</th></tr>
<tr><td>1</td><td rowspan="2">Very Low</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td rowspan="2">Very Low to Low</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td>Low</td></tr>
<tr><td>6</td><td rowspan="2">Low to Moderate</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td>Moderate</td></tr>
<tr><td>9</td><td rowspan="2">Moderate to High</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td><td>High</td></tr>
<tr><td>12</td><td rowspan="2">High to Very High</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td><td rowspan="2">Very High</td></tr>
<tr><td>15</td></tr>
</table>

Table 4: Soil Agricultural Potential Criteria

| Criteria | Description |
|---|---|
| Rock Complex | If a soil type has prevalent rocks in the upper sections of the soil, it is a limiting factor to the soil's agricultural potential. |
| Flooding Risk | The risk of flooding is determined by the closeness of the soil to water sources. |
| Erosion Risk | The soil erosion risk is determined by combining the wind and water erosion potentials. |
| Slope | The slope of the site could limit its agricultural use. |
| Texture | The texture of the soil can limit its use by being too sandy or too clayey. |
| Depth | The effective depth of soil is critical for the rooting zone for crops. |
| Drainage | The capability of soil to drain water is important as most grain crops do not tolerate submergence in water. |
| Mechanical Limitations | Mechanical limitations are any factors that could prevent the soil from being tilled or ploughed. |
| pH | The pH of the soil is important when considering soil nutrients and fertility. |
| Soil Capability | This section highlights the soil type's capability to sustain agriculture. |
| Climate Class | The climate class highlights the prevalent climatic conditions that could influence the agricultural use of a site. |
| Land Capability / Agricultural Potential | The land capability or agricultural potential rating for a site combines the soil capability and the climate class to arrive at the potential of the site to support agriculture. |

### 2.4 DFFE Screening Tool

The Agricultural Agro-Ecosystem Assessment protocol provides the criteria for assessing and reporting impacts on agricultural resources for activities requiring Environmental Authorisation (EA). The assessment requirements of this protocol are associated with a level of environmental sensitivity determined by the national web-based environmental screening tool, which, for agricultural resources, is based on the most recent land capability evaluation values provided by the Department of Forestry, Fisheries, and the Environment (DFFE). The national web-based environmental screening tool can be accessed at: https://screening.environment.gov.za/screeningtool.

The primary purpose of the Agricultural Agro-Ecosystem Assessment is to determine the site's sensitivity considering the proposed land use change (from potential agricultural land to the proposed development is sufficiently considered). The information in this report aims to enable the Competent Authority (CA) to draw a sound conclusions and recommendations on the proposed project and its potential impacts with a specific focus on food security.

To meet this objective, the protocol requires that site sensitivity verification be conducted, and subsequent outcomes must meet the following objectives:

- It must confirm or dispute the current land use and the environmental sensitivity as indicated by the National Environmental Screening Tool;
- It must contain proof (e.g., photographs) of the current land use and environmental sensitivity of the study area;
- All data and conclusions are submitted together with the main report for the proposed development;
- It must indicate whether the proposed development will have an unacceptable impact on the agricultural production capability of the site, and if it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources and
- The report is prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The report is thus compiled to meet the minimum report content requirements for impacts on agricultural resources by the proposed development.

### 2.5 DFFE Screening Tool

The Screening tool for the study area is presented in Figure 3 below:

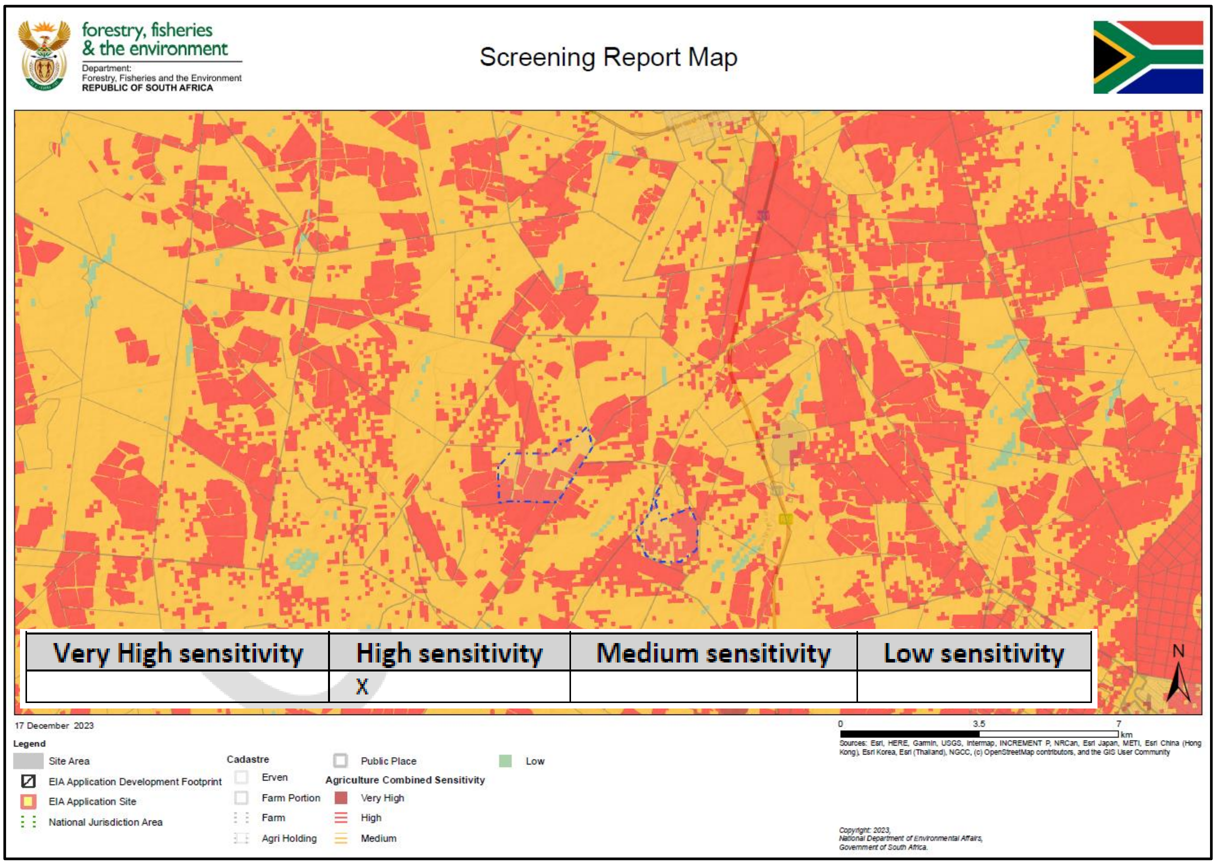


Figure 2: Screening tool sensitivity for the study area.

## 3. DESKTOP RESULTS AND DISCUSSIONS

### 3.1 Climatic Data

The study area falls with the subtropical highland climate or Monsoon-influenced temperate oceanic climate, characterised by dry, cold winters and warm, wet summers. Heavy precipitation occurs during the summers because of the seasonal presence of unstable, humid air masses that encourage the development of thunderstorms. The mean annual rainfall ranges between 601-800 mm, which is deemed adequate to support rainfed agriculture. However, planting dates and the length of the growing season may be affected and must be carefully considered. Figure 4 shows the mean annual rainfall associated with the study area.

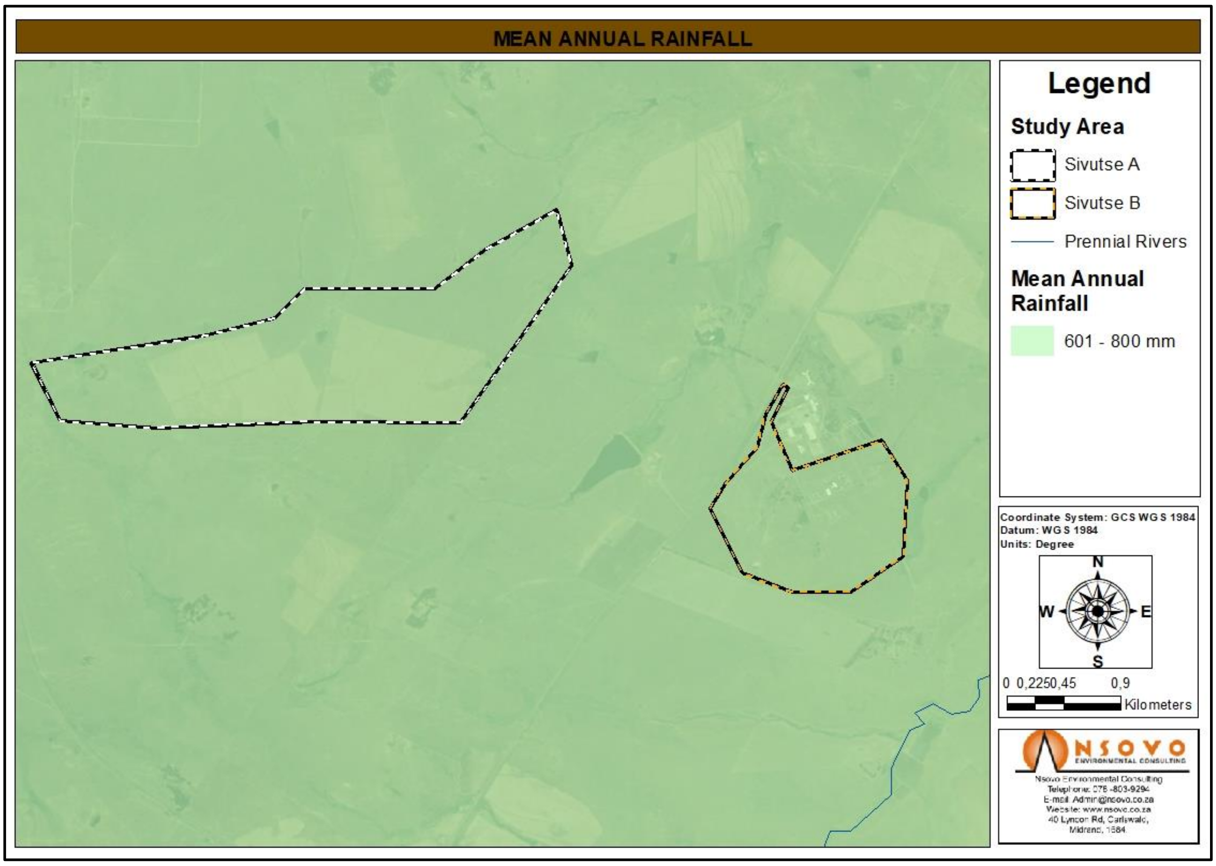


Figure 3: Mean Annual Rainfall associated with the study area.

### 3.2 Geology

The entire study area is underlain by the dolerite geological formation. Dolerite is a medium- to fine-grained, dark crystalline rock which formed underground when lava feeding the volcanoes cooled in its feeder pipes – sills (horizontal) and dykes (vertical). Dolerite dykes and sills are very common, often seen intruding on other rock layers. Because of its high iron content, dolerite weathers to a bright red soil. Dolerite is the medium-grained equivalent of basalt and gabbro. The dolerite is more resistant to weathering and erosion than the surrounding sedimentary rocks, so the dolerite stands out from the surrounding landscape as a row of koppies. Figure 5, below, depicts the geology associated with the study area.

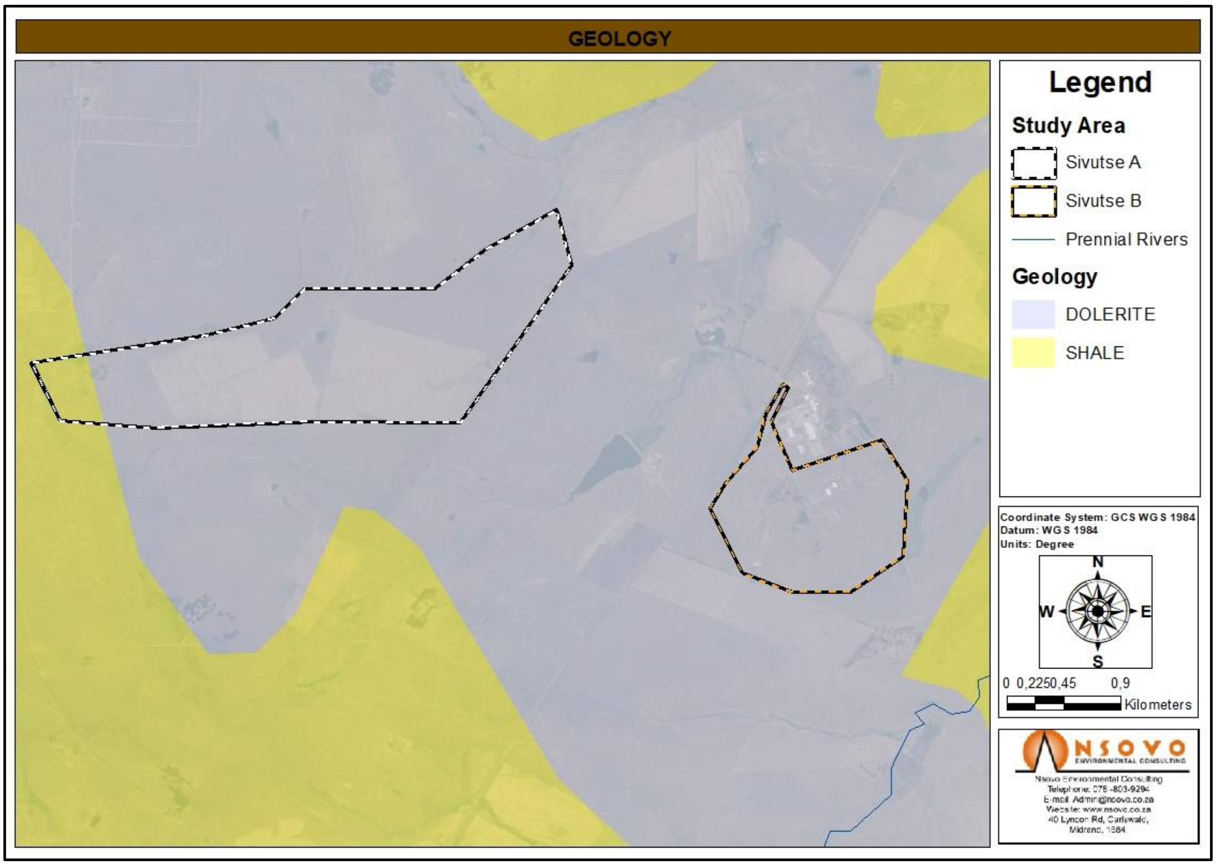


Figure 4: Geological formations associated with the study area.

### 3.3 Clay Content

The entire study area is characterized by a clay content between 15% and 35%. The clay content between 15% and 35% can be considered essential as the soil can hold more water during the fallow period, thus allowing for storage. These soils tend to be high in nutrients and do not have the propensity to leach nutrients; however, they are more inclined to be compacted, and thus, careful management strategies will need to be employed when cultivating on these soils.

### 3.4 Soil pH

The soil pH associated with the soils occurring within the study area is between 5.5 and 6.4, which is slightly acidic. The low pH can be attributed to other factors such as the parent material, loss of organic matter, removal of soil minerals when crops are harvested, erosion of the surface layer, and effects of nitrogen and sulphur fertilizers. Figure 7, below, depicts the soil pH associated with soils occurring within the study area.

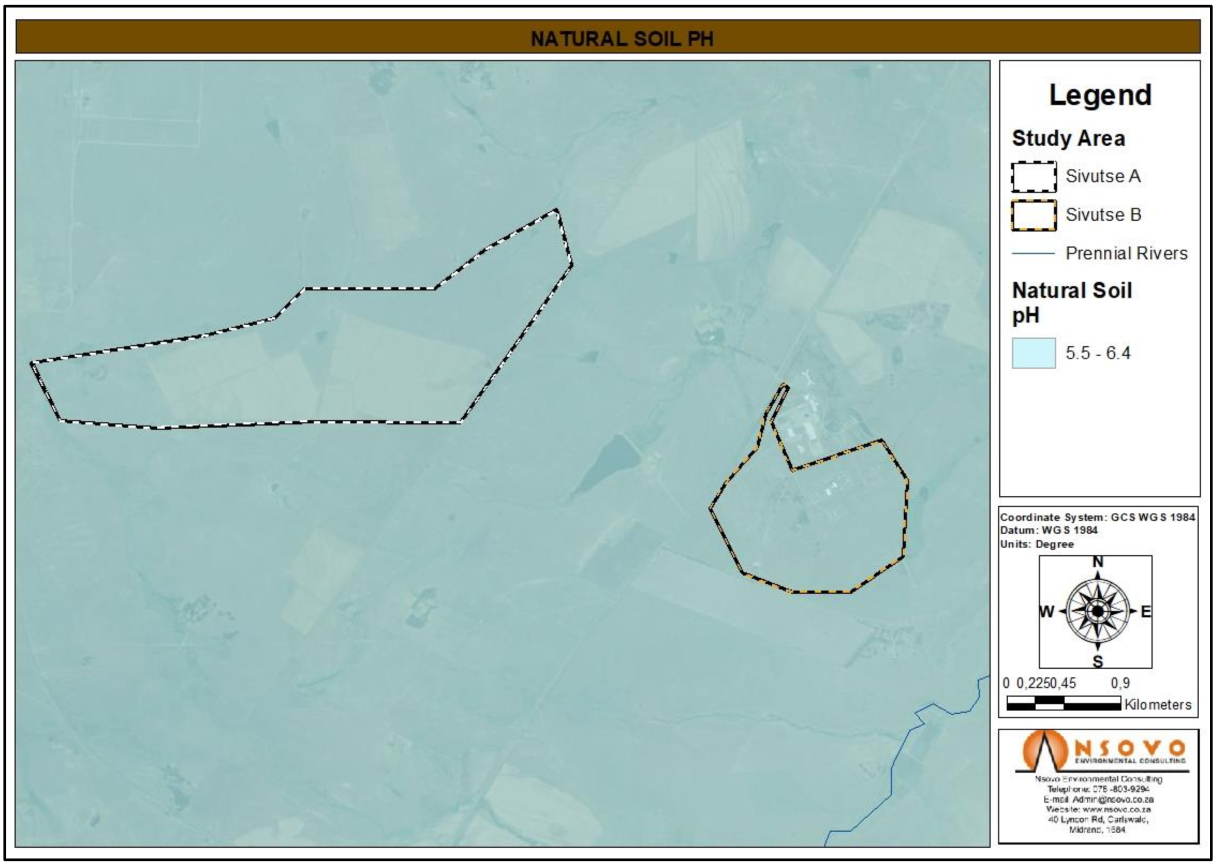


Figure 5: Soil pH associated with the project area.

### 3.5 Soil and Terrain (SOTER) Dominant Soils

The entire study area is characterised by Eutric Planosols. These soils are characterised by a marked textural differentiation between the top and subsoil horizons. The subsoil horizons are typically clay enriched when compared to the sandier topsoil horizons because of clay illuviation and, thus, causing dense, strongly structured, and slowly permeable subsoil horizons. These soils are prone to waterlogging conditions due to impeded water percolation, and root penetration may be difficult for a wide variety of crops; and thus, only suitably adapted crops may be planted. Therefore, limiting the choice of crop to be cultivated. Figure 8 below illustrates the SOTER Dominant soils associated with the study area.

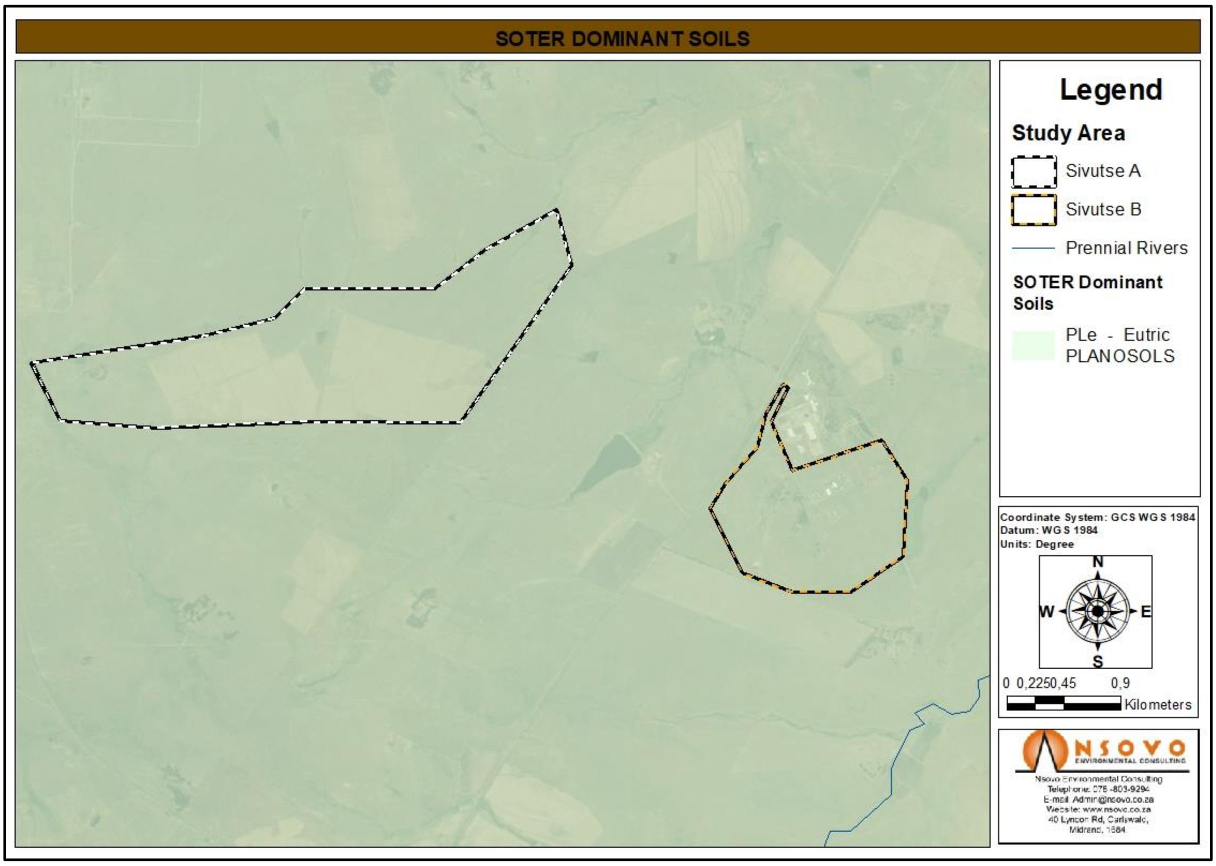


Figure 6: SOTER dominant soils associated with the study area.

### 3.6 Landtype Classes

The Ca landtypes associated with the study area are the Ca2 Landtype. The Ca landtypes are characterised Plinthic landscapes with commonly occurring upland duplex and margalitic soils (base saturated, free lime, very strongly structured, hard consistence and 2:1 lattice clays). These strongly structured soils require extensive management strategies to be cultivated on as their strong structure will likely impede root penetration and only adapted crops can be cultivated, thus limiting the choice of crop. Figure 9 below depicts the landtypes classes associated with the study area.

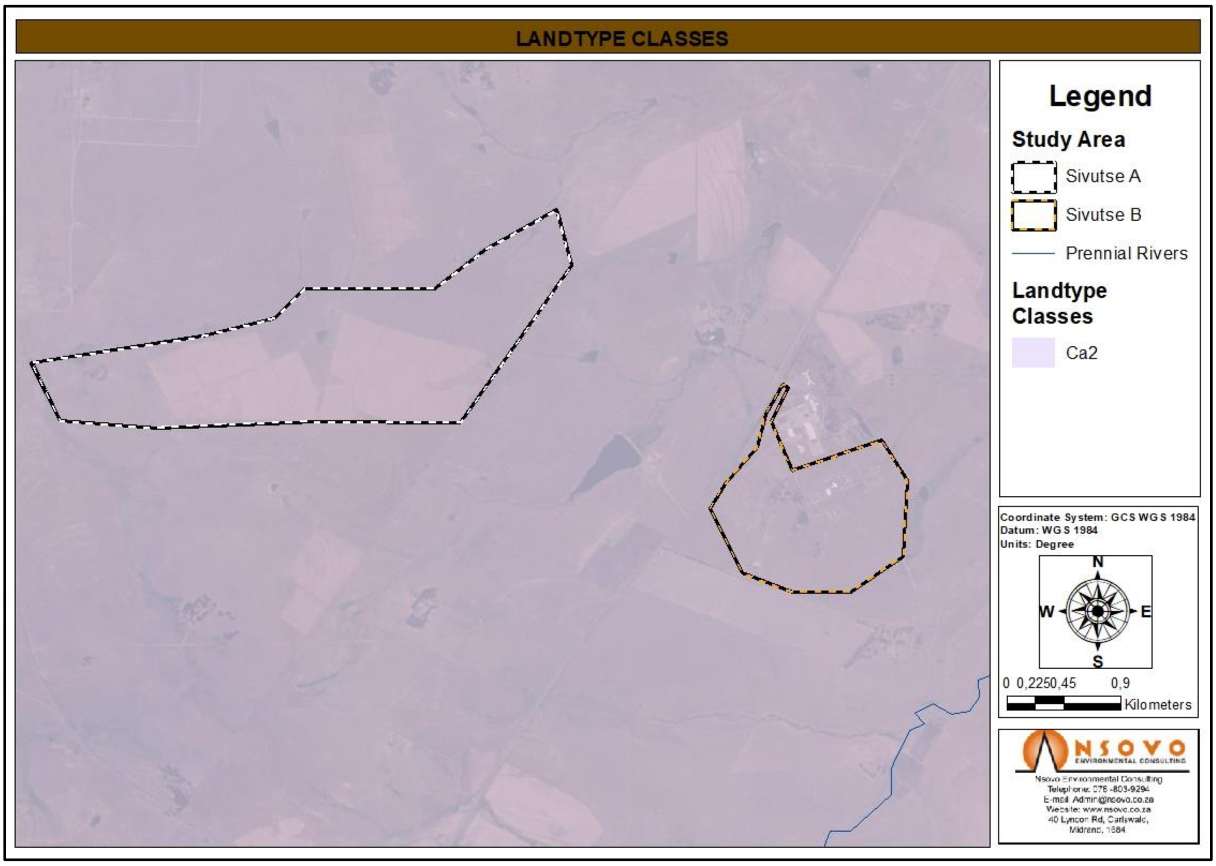


Figure 7: Desktop land capability associated with the study area.

### 3.7 Desktop Land Capability

The desktop land capability associated with the soils occurring within the study area is non-arable, grazing, woodland, or wildlife capability (Class VII). Figure 10 below shows the desktop land capability associated with the study area.

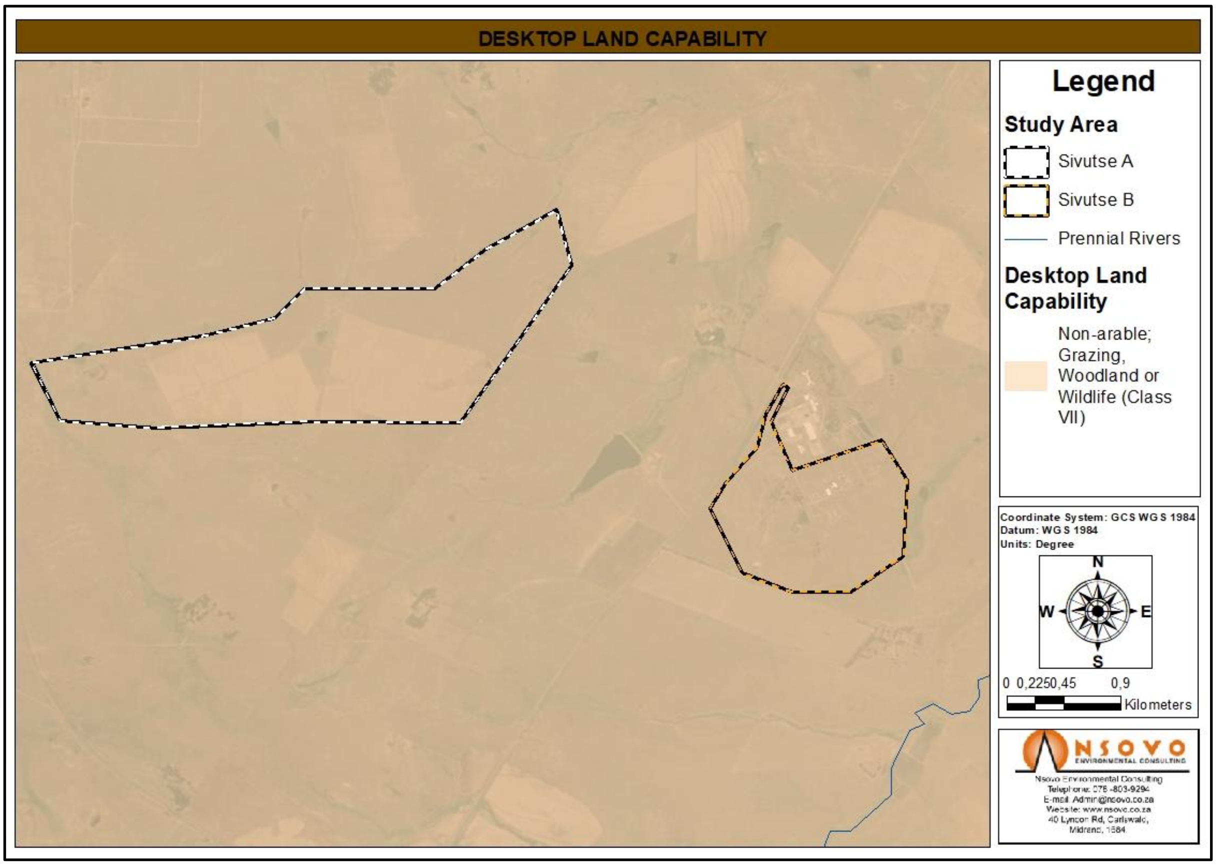


Figure 8: Desktop land capability associated with the study area.

### 3.8 Soil Potential

The potential of soils associated with the study area is characterised as not suitable for arable agriculture, suitable for forestry or grazing where climate permits. Figure 11 below depicts the soil potential associated with the study area.

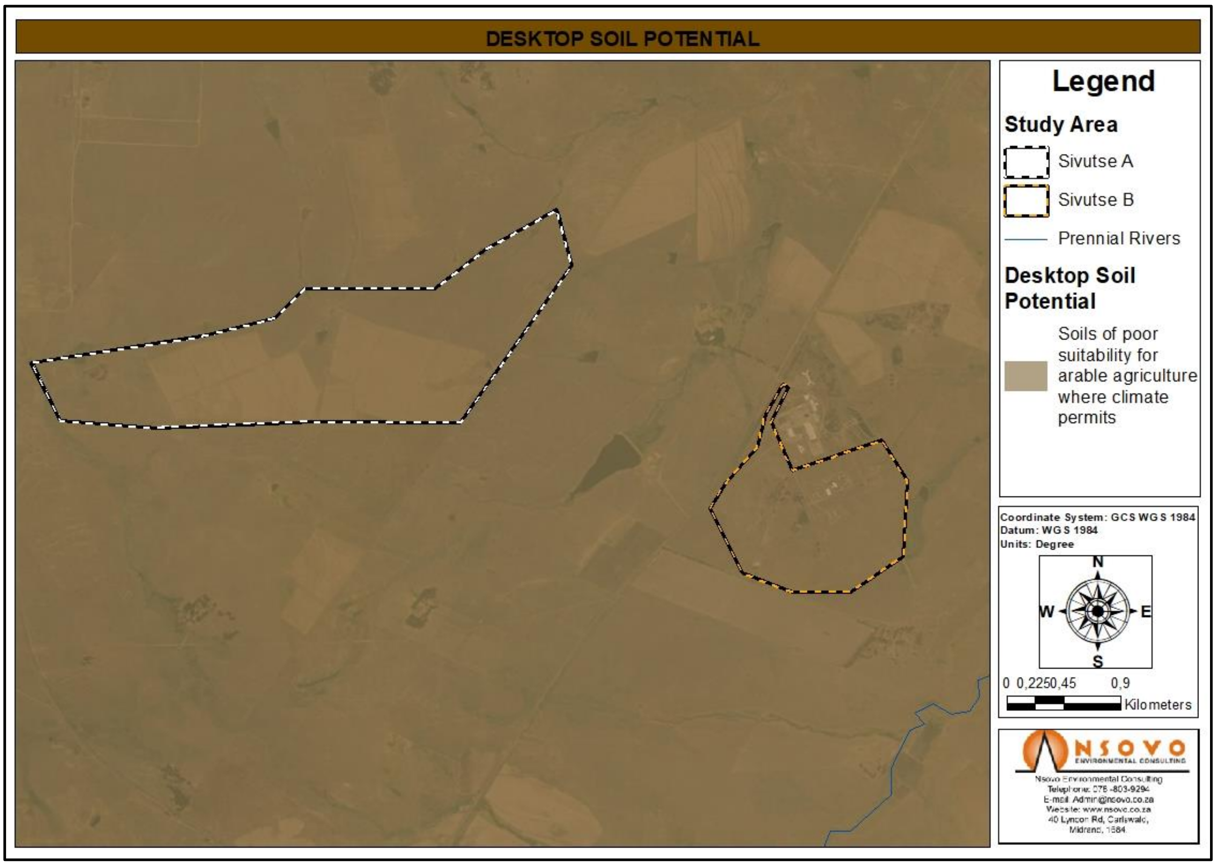


Figure 9: Soil potential associated with the study area.

## 4. FIELD VERIFIED RESULTS AND DISCUSSIONS

### 4.1 Land Uses within the Study Area

The study area comprises largely of open veld, utilised primarily for livestock grazing. Maize cultivation was observed along the western portion of the study area. The Majuba Rail Project office is located immediately east of the study area. No signs of land degradation, such as erosion gullies, were identified within the study area. Figure 12 depicts the different land uses identified within the study area.

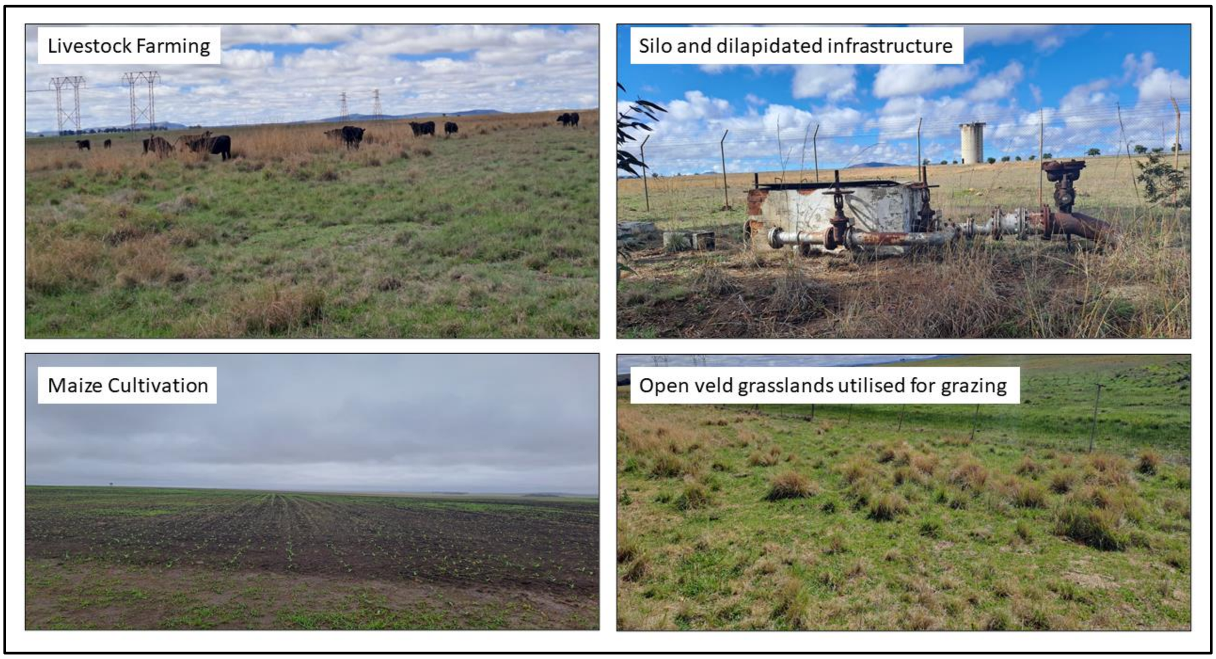


Figure 10: Land uses associated with the study area.

### 4.2 Soil Forms in the Study Area

The section below focuses on the identified soil forms within the study area and is described below. The spatial distribution of the identified soil forms within each study area is presented in Figure 16. The summary table depicting the area of coverage of each specified soil form is presented in Table 4.

#### 4.1.1 Mispah/Glenrosa

The Mispah/Glenrosa soil types is associated with poor physical properties for plant root system penetration and water infiltration, due to the shallow nature of the soil and/or limiting impeding layer of the underlying parent material. Based on the degree of weathering some lithic material of varying sizes can be mixed closely with soil material. These types of soils are usually avoided for intensive use and thus left for grazing, forestry, and wildlife land uses. The Mispah/Glenrosa soil form is classified under the Grazing (Class VI) land capability class as they are primarily suited for perennial vegetation and have limitations that preclude cultivation. Figure 13 below illustrates the shallow nature of the Mispah/Glenrosa soil form.

Figure 11: View of the identified shallow Mispah/Glenrosa soil forms.

### 4.1.2 Swartland

The soils of duplex character such as the Swartland formation are characterised by moderately to strongly structured soils with a clear textural distinction between a sandier surface horizon and a higher clay upper subsurface horizon. These types of soils are typically not preferred for cultivation due to the high clay content, strong structure and are prone to waterlogging (highly impermeable when wet). Waterlogging conditions make these soils prone experiencing runoff during high rainfall events and thus the formation of erosion gullies over time. Nonetheless, should these soils be cultivated, intensive management practices would be required. Figure 14 below illustrates the high in clay and strong structured soils associated with the Swartland formation.

Figure 12: View of the identified high clay Swartland soil forms.

### 4.1.3 Grabouw

The Grabouw soil formation can be characterized as soils that have been altered to improve agricultural production through land preparation and breaking of the plough layer (deep in-situ ripping) to increase the infiltration capacity and root penetration. This has resulted in the original horizon sequence no longer being recognizable and present in disjointed order while remaining within its essential original location. The Grabouw are characterized by stoniness and a shallower depth; however, tillage practices were used to improve the soils for cultivation, and thus these soils are classified under the Arable (Class IV). Figure 15 below depicts the transformed soils and the underlying lithic material excavated during the deep in-situ ripping.

Figure 13: View of the transformed Grabouw soil form.

#### 4.1.4 Katspruit

The Katspruit soil forms (wetland soils) are generally limited to supporting plants tolerant to prolonged wet conditions (i.e., hydrophytes). These soils, as they are associated with wetlands, are of low agricultural potential due to various limiting factors such as high clay content and waterlogging conditions, thus creating anaerobic conditions that are not suitable for most cultivated crops. These soils are classified under the Wet-based soils (Class V) land capability class, and frequent waterlogging is their main limitation. Figure 16 below depicts the soils associated with the Katspruit soil form.

Figure 14: View of the identified Katspruit soil forms.

### 4.1.5 Dundee

The Dundee soils form is associated with watercourses due to the unconsolidated soil material as a result of deposition by water. These soils are characterised by little evidence of pedogenic horizonation and the presence of clear stratifications may be observed. These soils may contain weathered hard rock fragments sometimes identified as pebbles. These soils typically occur on low lying terrain positions. These soils are classified under the Wet-based soils (Class V) land capability class, and frequent waterlogging is their main limitation. Figure 17 below shows the watercourses associated with the Dundee soil formation.

Figure 15: View of the identified Dundee soil forms

#### 4.1.6 Willowbrook

These soils are associated with the artificial dam within the eastern portion of the study area. These soils are characterised by long term saturation with water and are associated with wetland areas. These soils are of low agricultural potential due to various limiting factors such as high clay content and waterlogging conditions, thus creating anaerobic conditions that are not suitable for most cultivated crops. These soils are classified under the Wet-based soils (Class V) land capability class, and frequent waterlogging is their main limitation. Figure 18 below depicts the soils associated with the Willowbrook soil form.

Figure 16: Artificial dam associated with the Willowbrook soils.

Table 5: Soil forms in hectares (ha) occurring within the study area.

| Renewstable Sivutse Study Area | | | | |
|---|---|---|---|---|
| Soil Forms | Area (Ha) | Percentage (%) | Land Capability Class – According to (Smith, 2006) | Agricultural Potential |
| Grabouw | 128.70 | 27.6 | Arable (Class IV) | Moderate |
| Swartland | 49.20 | 10.6 | | |
| Katspruit | 13.18 | 2.8 | Watercourse (Class V) | Very Low |
| Willowbrook | 1.42 | 0.3 | | |
| Dundee | 0.40 | 0.1 | | |
| Mispah/Glenrosa | 264.43 | 56.8 | Grazing (Class VI) | Low |
| Witbank | 0.82 | 0.2 | Wilderness (Class VIII) | Very Low |
| Infrastructure | 7.61 | 1.6 | - | - |
| **Total Enclosed** | **332.77** | **100** | | |

Table 6: Land capability (DAFF, 2016) associated with the soils occurring within the study area.

| Soil Form | Land Capability Groups | DAFF (2016) Classification |
|---|---|---|
| Grabouw | Arable Land | 8. Moderate |
| Swartland | | |
| Katspruit | Watercourse | 5. Low |
| Willowbrook | | |
| Dundee | | |
| Mispah/Glenrosa | Grazing Land | 6. Low- Moderate |
| Witbank | Wilderness/Disturbed | 2. Very Low |

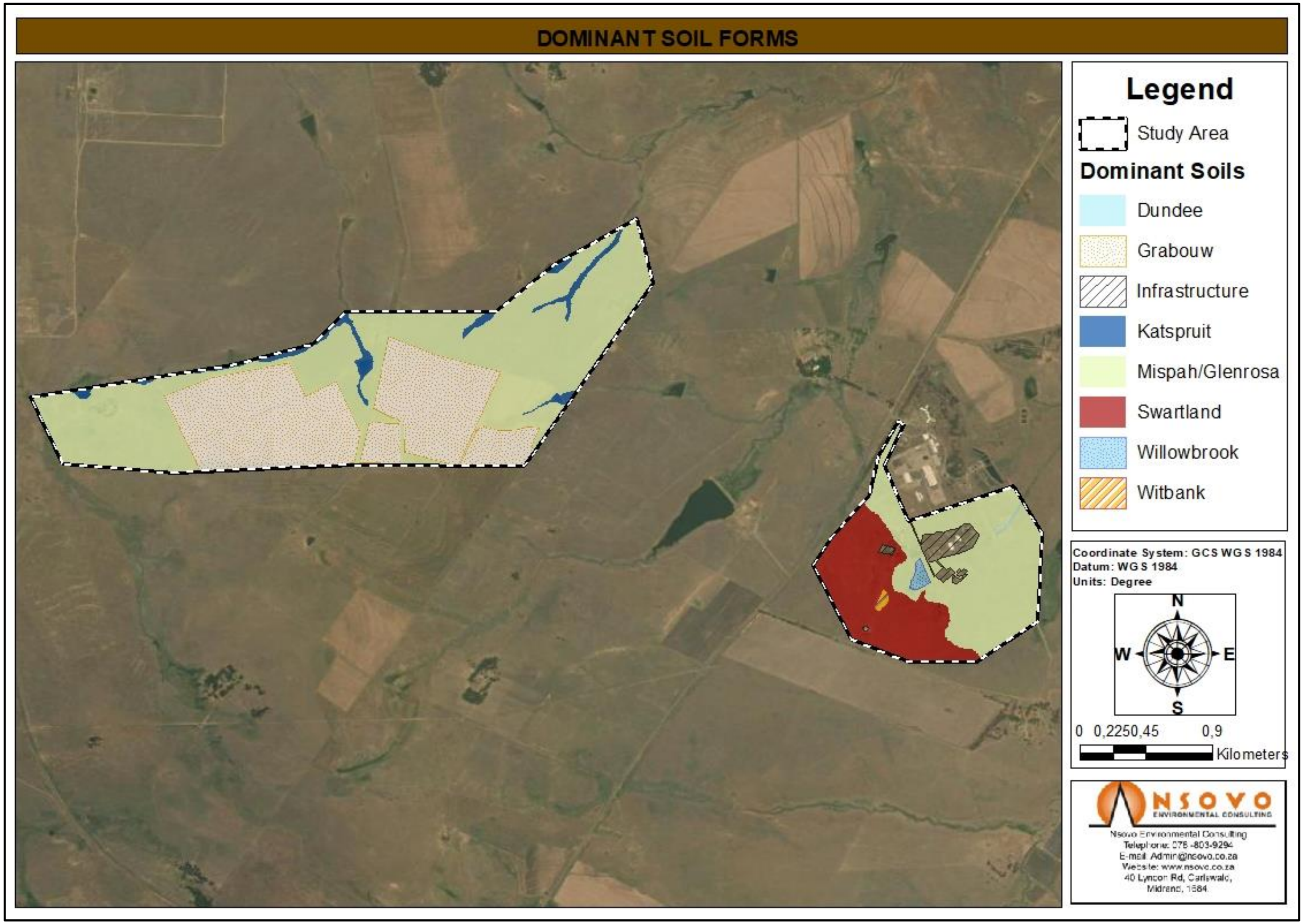


Figure 17: Dominant soils form within the study area.

### 4.3 Land Capability and Agricultural Potential

Land Capability is defined as the most intensive long-term use of land for purposes of rainfed farming, determined by the interaction of climate, soil, and terrain. The soil physical properties with which the agricultural potential for this assessment, agricultural sensitivity, was inferred in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Figures 19 and 20 below depict the land capabilities, while Figure 21 depicts the agricultural potential.

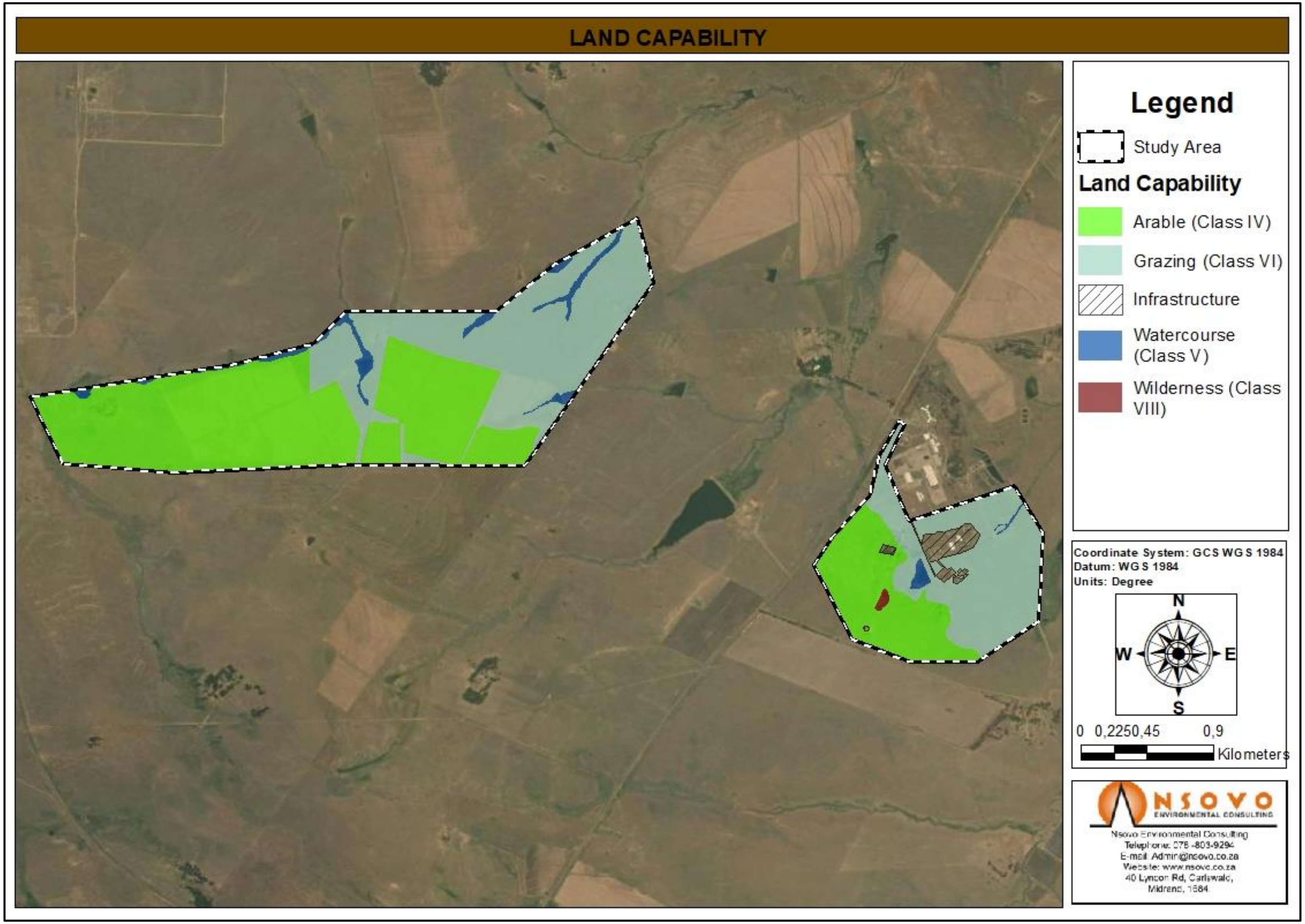


Figure 18: Map depicting land capability of soils within the Study Area.

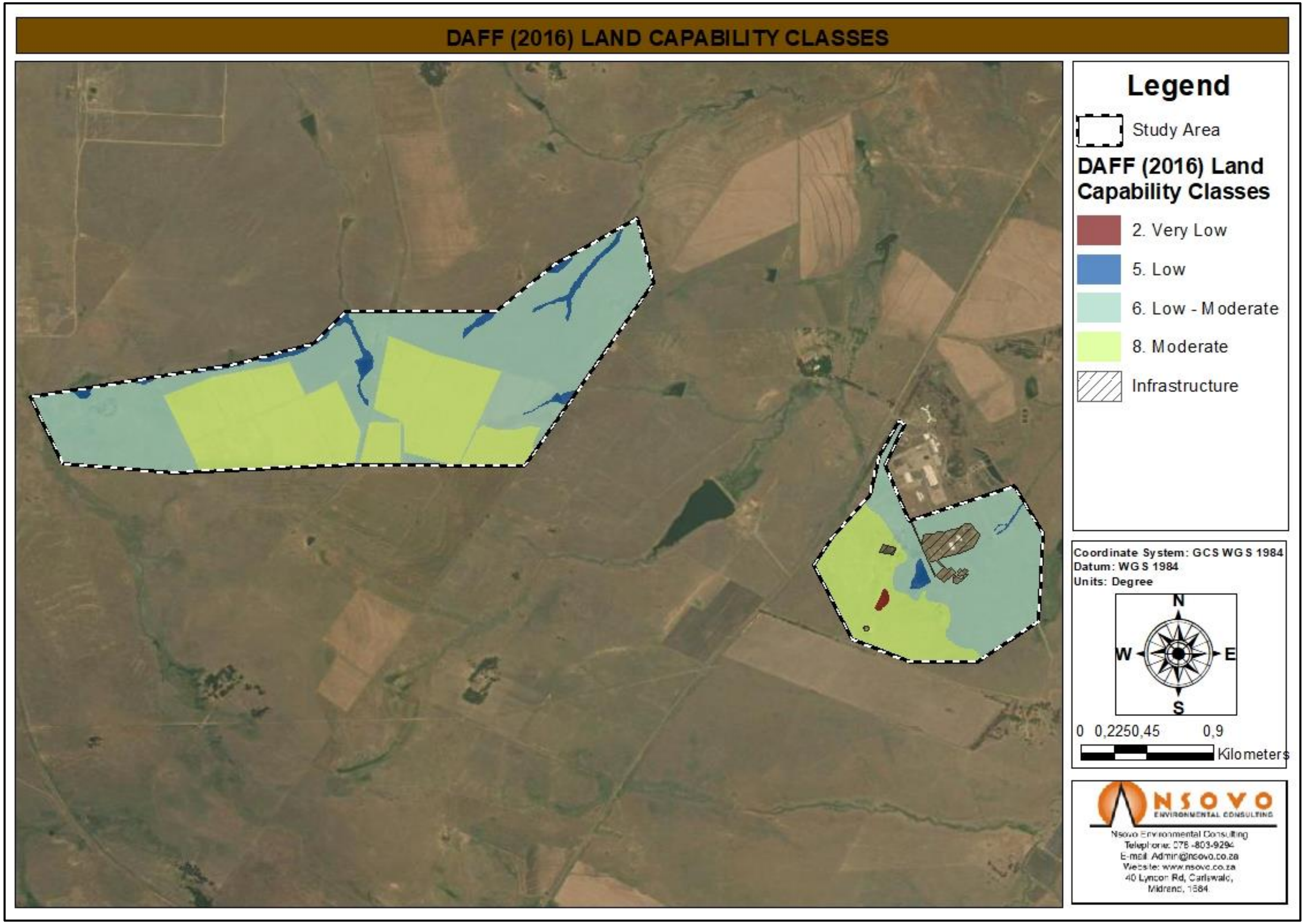


Figure 19: Land capability (DAFF, 2016) of the soil forms associated with the study area.

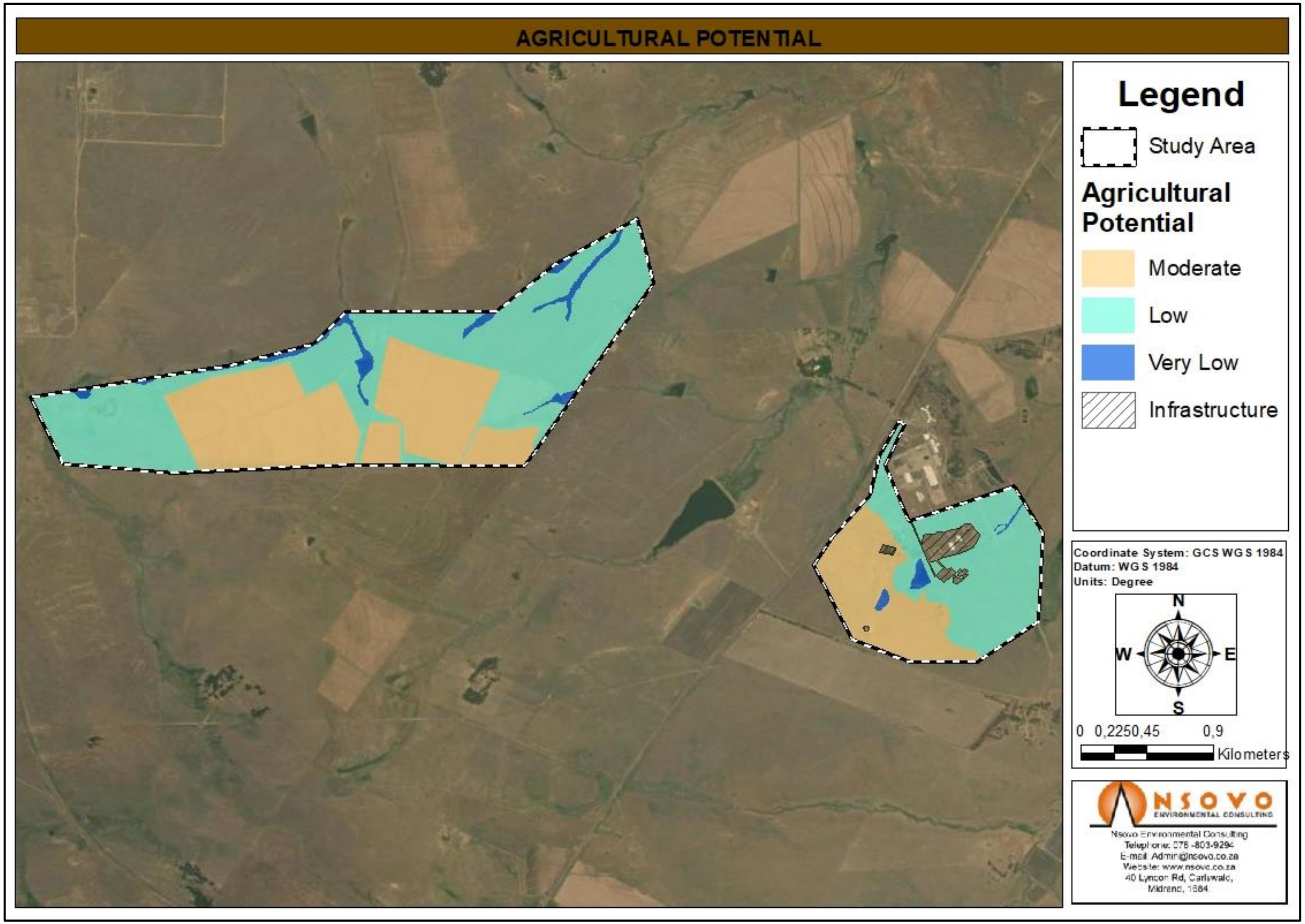


Figure 20: Agricultural potential for soils associated with the soils occurring within the study area.

# 5. IMPACT ASSESSMENT

## 5.1 Assessment Methodology

According to the NEMA regulations (2014), all the impact assessments should provide quantified scores that likely show the expected impact and those likely to result from proposed activities. Significance scoring both assesses and predicts the environmental impacts through the evaluation of the following factors;

- Probability of the impact,
- Duration of the impact,
- Extent of the impact, and
- Magnitude of the impact.

The objective of the impact assessment is to identify and assess all the significant impacts that may arise as a result of the Proposed Development's implementation and present the consequences to the competent authority.

For each of the main project phases, the existing and potential future impacts and benefits (associated only with the Proposed Development) were described using the criteria listed in Appendix B. This was done in accordance with the EIA Regulations, promulgated in terms of Section 24 of the NEMA and the criteria drawn from the Integrated Environmental Management (IEM) Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts, published by the Department of Environmental Affairs (April 1998).

The significance of the impacts that may occur due to the proposed activities and a description of the mitigation required to limit the identified adverse impacts on the identified soils on site are presented in Section 5.2 below.

## 5.2 Impact Assessment Per Project Phase

### 5.2.1 Construction Phase

During the construction phase of the proposed development, the soils are anticipated to be exposed to erosion, dust emission, potential soil contamination, and loss of land capability impacts. The main envisaged activities include the following:

- Earthworks will include clearing of vegetation from the surface and stripping topsoil (soil excavation) for foundation preparation where the proposed infrastructure is to be placed. These activities are the most disruptive to natural soil horizon distribution and will impact the current soil hydrological properties and functionality of soil if not mitigated properly;
- Frequent movement of heavy machinery increasing the likelihood of soil contamination from petroleum, oil, and grease substances;

- Other activities in this phase that will impact soil are handling and storing building materials and different kinds of waste. When not managed properly, these activities have the potential to result in soil pollution.

The disturbance of original soil profiles and horizon sequences of these profiles during earthworks is considered to be a measurable deterioration in terms of erosion. This impact is considered to be localised within the development footprint. This impact will be localised within the site boundary and have medium significance on the soil resource if not managed.

Soil chemical pollution as a result of potential oil and fuel spillages from vehicles, is considered to be a moderate deterioration of the soil resource. This impact will be localised within the site boundary and have medium significance on the soil resource if not managed.

Soil compaction will be a measurable deterioration that will occur as a result of the heavy vehicles commuting on the existing roads as well as any newly constructed access road to increase access to the solar PV plant and the hydrogen plant. The impacts will be localised within the site boundary with medium consequence and significance without mitigation measures.

### 5.2.2 Operational Phase

The operational phase includes the completion and operation of the proposed development and the perceived impacts include possible runoff, resulting in risk of erosion, constant disturbances of soils by maintenance vehicles and machinery increasing the risk of soil compaction and poor waste management, resulting in waste materials being improperly stored increasing the risk of soil compaction.

The main envisaged operational activities that will impact soil, land use, and land capability include the following:

- General activities including transport on access roads will result in soil compaction or generation of runoff, respectively.
- Waste generation (non-mineral waste) and accidental spills and leaks may result in soil chemical pollution if not managed.

The disturbance of original soil profiles and horizon sequences of these profiles is considered a measurable deterioration, leading to soil erosion. This impact is reversible over time but will be localised within the site boundary. This impact is possible and will have medium significance if not managed.

Soil chemical pollution, caused by pollutants leaching into subsurface soil horizons where waste is stored or from leaking maintenance vehicles, is considered to be a moderate deterioration of the soil resource. If not mitigated properly, this impact will be localised within the site boundary and have medium significance on the soil resource.

Soil compaction will be a measurable deterioration that will occur due to the movement of vehicles on the soil surfaces (including access roads). This reversible impact over time will be localised within the site boundary with medium consequence and significance if not mitigated properly.

The change in land use will result in the loss of the current land capability and land use, as the agricultural practices currently being used will cease for the duration of the solar PV lifespan.

### 5.2.3 Closure and Decommissioning Phase

Decommissioning can be considered the reverse of the construction phase, with the demolition and removal of the majority of infrastructure and activities very similar to those described in the construction phase.

The main envisaged decommissioning activities that will impact on soil, land use, and land capability include the following:

- Transport of materials away from the site. This will compact the soil of the existing roads and fuel and oil spills from vehicles may result in soil chemical pollution.
- Earthworks will include redistribution of inert waste materials to fill the ponds and ditches and add topsoil to the soil surface. These activities will not further impact land use and capability but may increase soil compaction.
- Other activities in this phase that will impact soil are the handling and storing materials and different kinds of waste generated, as well as accidental spills and leaks with decommissioning activities. This will potentially result in soil pollution when not managed properly.

## 5.3 Impact Summary Tables

Tables 6 to 9 below present the impact summary tables for the impact on loss of land capability, soil erosion, soil compaction, and soil contamination.

Table 7: Rating of impacts for the loss of land capability and associated mitigation measures for all project phases.

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Construction Phase: | | | | | | | |
| Clearing vegetation and levelling soils where necessary, such as removing topsoil material to create the foundation for constructing solar PV, the hydrogen plant and temporary laydown areas. Road upgrades and maintenance potentially encroaching on cultivated areas | | | | | | | |
| | WOM | Neg | 3 | 2 | 8 | 5 | 65 |
| | WM | Neg | 2 | 1 | 6 | 4 | 36 |
| Mitigation Measures | | | | | | | |
| To minimise edge effects, the project operations should be kept within the demarcated footprint areas as far as practically possible. | | | | | | | |
| Avoid permanently impacting topsoil and subsoil but salvage the maximum depth of these when clearing areas for infrastructure. | | | | | | | |
| Use geotextiles and contours to control soil erosion and revegetate exposed soil surfaces where possible. | | | | | | | |
| Construction vehicle movement should be limited to within the project perimeter fence to avoid unnecessary compaction of adjacent soils. | | | | | | | |
| Always strip a suitable time before the placement or construction of the solar PV and hydrogen plant facilities to avoid soil loss and contamination. | | | | | | | |
| Access roads should be aligned to the existing road as far as practically possible to avoid further agricultural impact and unnecessary soil disturbance. | | | | | | | |
| Operational and Maintenance Phase | | | | | | | |
| Operation and maintenance of the solar PV and the hydrogen plant; constant traffic and frequent soil disturbances resulting in land capability loss. | | | | | | | |
| | No Corrective Measures | Neg | 3 | 4 | 6 | 3 | 39 |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Corrective Measures | | Neg | 1 | 4 | 4 | 3 | 27 |
| **Mitigation Measures** | | | | | | | |
| Maintenance vehicles should be checked for leakages of hydrocarbons before commencement of maintenance activities. | | | | | | | |
| The solar panels should be cleaned with clean water, and the use of chemicals should be avoided to minimise the likelihood of potential soil contamination. | | | | | | | |
| Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion. | | | | | | | |
| Use geotextiles and contours to prevent soil erosion and revegetate exposed soil surfaces where possible. | | | | | | | |
| **Decommissioning Phase** | | | | | | | |
| Potential future decommissioning activities will likely involve dismantling and removal of the power plant and other on-site buildings, equipment, and facilities, including possible excavation and removal of concrete pads; transferring of waste materials to disposal, recycling, and/or treatment facilities, as applicable (where re-use is not possible) | | | | | | | |
| No Corrective Measures | | Neg | 2 | 2 | 6 | 3 | 30 |
| Corrective Measures | | Neg | 1 | 1 | 4 | 3 | 18 |
| **Mitigation Measures** | | | | | | | |
| The Study area should be revegetated with indigenous vegetation to help with erosion and dust control as required or returned to agricultural use. | | | | | | | |
| Establish natural drainage patterns as pre-construction through recontouring and revegetation. | | | | | | | |
| Dismantled equipment should be recycled, and non-recyclable material should be appropriately land filled by an approved service provider. | | | | | | | |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Any portions of the site with compacted soil should be decompacted, and any excavations backfilled with soils to restore the site for future use. | | | | | | | |

Table 8: Rating of impacts for soil erosion and associated mitigation measures for all project phases.

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Construction Phase: | | | | | | | |
| Clearing vegetation and levelling soils where necessary, such as removing topsoil material to create the foundation for constructing solar PV, the hydrogen plant, and temporary laydown areas. Road upgrades and maintenance potentially encroach on cultivated areas and increase the likelihood of soil erosion. | | | | | | | |
| WOM | | Neg | 3 | 2 | 6 | 5 | 55 |
| WM | | Neg | 2 | 1 | 4 | 4 | 28 |
| Mitigation Measures | | | | | | | |
| The project operations must be kept within the demarcated footprint areas as far as practically possible to minimise edge effects. | | | | | | | |
| No site-clearing activities should take place during periods of heavy rainfall. | | | | | | | |
| access roads should be sloped at a lower gradient. Access roads should be inclined at a lower gradient to reduce runoff-induced erosion. | | | | | | | |
| Use geotextiles and contours to control soil erosion and revegetate exposed soil surfaces where possible. | | | | | | | |
| Consideration needs to be given to the use of water for dust suppression– the use of binding agents like molasses should be considered for unsealed roads and dust suppression. | | | | | | | |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Always strip a suitable time before the placement or construction of the solar PV and hydrogen plant facilities to avoid soil loss and contamination. | | | | | | | |
| Access roads should be aligned to the existing road as far as practically possible to avoid further agricultural impact and unnecessary soil disturbance. | | | | | | | |
| **Operational and Maintenance Phase** | | | | | | | |
| Operation and maintenance of the solar PV and the hydrogen plant; constant traffic and frequent capability soil; soil disturbances resulting in land capability loss. | | | | | | | |
| No Corrective Measures | | Neg | 2 | 4 | 6 | 3 | 36 |
| Corrective Measures | | Neg | 1 | 4 | 4 | 3 | 27 |
| **Mitigation Measures** | | | | | | | |
| Maintenance vehicles should be checked for leakages of hydrocarbons before the commencement of maintenance activities. | | | | | | | |
| The solar panels should be cleaned with clean water, and the use of chemicals should be avoided to minimise the likelihood of potential soil contamination. | | | | | | | |
| Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion. | | | | | | | |
| Use geotextiles and contours to prevent soil erosion and revegetate exposed soil surfaces where possible. | | | | | | | |
| **Decommissioning Phase** | | | | | | | |
| Potential future decommissioning activities will likely involve dismantling and removal of the power plant and other on-site buildings, equipment, and facilities, including possible excavation and removal of concrete pads; transferring of waste materials to disposal, recycling, and/or treatment facilities, as applicable (where re-use is not possible) | | | | | | | |
| No Corrective Measures | | Neg | 2 | 2 | 6 | 3 | 30 |
| Corrective Measures | | Neg | 1 | 1 | 4 | 3 | 18 |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Mitigation Measures | | | | | | | |
| The Study area should be revegetated with indigenous vegetation to help with erosion and dust control as required or returned to agricultural use. | | | | | | | |
| Establish natural drainage patterns as pre-construction through recontouring and revegetation. | | | | | | | |
| Dismantled equipment should be recycled, and non-recyclable material should be appropriately land filled by an approved service provider. | | | | | | | |
| Any portions of the site with compacted soil should be de-compacted and any excavations backfilled with soils to restore the site for future use. | | | | | | | |

Table 9: Rating of impacts on soil compaction and associated mitigation measures for all project phases.

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Construction Phase: | | | | | | | |
| Heavy vehicle traffic within and around the study area and potentially compacting the soil during the construction of solar PV, the hydrogen plant and temporary laydown areas. | | | | | | | |
| WOM | | Neg | 2 | 2 | 6 | 5 | 50 |
| WM | | Neg | 2 | 1 | 4 | 4 | 28 |
| Mitigation Measures | | | | | | | |
| The project operations be kept within the demarcated footprint areas as far as practically possible to minimise edge effects. | | | | | | | |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Unnecessary trafficking and movement over the areas targeted for construction must be avoided, especially heavy machinery | | | | | | | |
| No site clearing activities should take place during periods of heavy rainfall. | | | | | | | |
| Loosening of the soil through ripping and discing prior to the stripping process is recommended to break up crusting. | | | | | | | |
| Compacted soils should be ripped at least 20cm to alleviate. | | | | | | | |
| Access roads should be aligned to the existing road as far as practically possible to avoid further agricultural impact and unnecessary soil disturbance. | | | | | | | |
| **Operational and Maintenance Phase** | | | | | | | |
| Operation and maintenance of the solar PV and the hydrogen plant; constant traffic and frequent disturbances of soils resulting in soil compaction. | | | | | | | |
| No Corrective Measures | | Neg | 2 | 4 | 6 | 3 | 36 |
| Corrective Measures | | Neg | 1 | 4 | 4 | 3 | 27 |
| **Mitigation Measures** | | | | | | | |
| Loosening of the soil through ripping and discing prior to the stripping process is recommended to break up crusting | | | | | | | |
| Unnecessary trafficking and movement over the areas targeted for construction must be avoided, especially heavy machinery | | | | | | | |
| Disturbed areas adjacent to the footprint area should be revegetated with indigenous grass mix to limit potential soil compaction. | | | | | | | |
| Access roads should be inspected and maintained as necessary. | | | | | | | |
| **Decommissioning Phase** | | | | | | | |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Potential future decommissioning activities will likely involve dismantling and removal of the power plant and other on-site buildings, equipment, and facilities. During this period, there will be heavy vehicular traffic and thus increasing the likelihood of soil compaction. | | | | | | | |
| No Corrective Measures | | Neg | 2 | 2 | 6 | 3 | 30 |
| Corrective Measures | | Neg | 1 | 1 | 4 | 3 | 18 |
| Mitigation Measures | | | | | | | |
| The study area should be revegetated with indigenous vegetation to help with soil compaction, runoff, erosion and dust control as required or returned to agricultural use. | | | | | | | |
| Establish natural drainage patterns as pre-construction through recontouring, revegetation, and ripping soils to alleviate soil compaction. | | | | | | | |
| Dismantled equipment should be recycled, and non-recyclable material should be appropriately landfilled by an approved service provider. | | | | | | | |
| Any portions of the site with compacted soil should be de-compacted and any excavations backfilled with soils to restore the site for future use. | | | | | | | |

Table 10: Rating of impacts on soil contamination and associated mitigation measures for all project phases.

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Construction Phase: | | | | | | | |
| Leaching of hydrocarbon chemicals into the soils from maintenance equipment, solar PV, or hydrogen plant leads to alteration of the soil chemical status as well as contamination of ground water. Potential hazardous and non-hazardous waste disposal, including waste material spills and refuse deposits into the soil. | | | | | | | |
| WOM | | Neg | 2 | 2 | 6 | 4 | 40 |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| WM | | Neg | 2 | 1 | 4 | 4 | 28 |
| Mitigation Measures | | | | | | | |
| The project operations be kept within the demarcated footprint areas as far as practically possible to minimise edge effects. | | | | | | | |
| Ensure proper handling and storage of hazardous chemicals and materials (e.g., fuel, oil, cement, concrete, reagents, etc.) as per their corresponding Safety Data Sheets. | | | | | | | |
| Maintenance of vehicles and equipment should be carried out in designated appropriate facilities fitted with spillage containment, floors, and sumps to capture any fugitive oils and greases. | | | | | | | |
| Implementing regular site inspections for materials handling and storage. | | | | | | | |
| Development of detailed procedures for spill containment and soil clean up. | | | | | | | |
| Operational and Maintenance Phase | | | | | | | |
| Direct chemical spills on soils from solar PV, hydrogen plants, construction vehicles, or other construction equipment used. | | | | | | | |
| No Corrective Measures | | Neg | 2 | 4 | 6 | 3 | 36 |
| Corrective Measures | | Neg | 1 | 4 | 4 | 3 | 27 |
| Mitigation Measures | | | | | | | |
| Ensure proper handling and storage of hazardous chemicals and materials (e.g., fuel, oil, cement, concrete, reagents, etc.) as per their corresponding Safety Data Sheets. | | | | | | | |
| Maintenance of vehicles and equipment should be carried out in designated appropriate facilities fitted with spillage containment, floors, and sumps to capture any fugitive oils and greases. | | | | | | | |
| Implementing regular site inspections for materials handling and storage. | | | | | | | |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Development of detailed procedures for spill containment and soil clean up. | | | | | | | |
| **Decommissioning Phase** | | | | | | | |
| Potential decommissioning activities will likely involve dismantling and removing the power plant and other on-site buildings, equipment, and facilities. During this period, there will be heavy vehicular traffic thus increasing the likelihood of soil contamination. | | | | | | | |
| No Corrective Measures | | Neg | 2 | 2 | 6 | 3 | 30 |
| Corrective Measures | | Neg | 1 | 1 | 4 | 3 | 18 |
| **Mitigation Measures** | | | | | | | |
| The study area should be revegetated with indigenous vegetation to help with soil compaction, runoff, erosion, and dust control as required or returned to agricultural use. | | | | | | | |
| Establish natural drainage patterns as pre-construction through recontouring, revegetation, and ripping soils to alleviate soil compaction. | | | | | | | |
| Dismantled equipment should be recycled, and an approved service provider should appropriately landfill non-recyclable material. | | | | | | | |
| Any portions of the site with compacted soil should be decompacted, and any excavations should be backfilled with soils to restore the site for future use. | | | | | | | |

### 5.4 Gross agricultural income from the study area

The majority of the soils (Mispah/Glenrosa) occurring within the study area, which account for 55.7%, do not have the arable land capability and the have not been used for crop production in the past ten years or so. The soils which were utilised for cultivation had to be reworked in order to increase their production capability. The potential gross income that can be generated from the land annually was calculated using the long-term average grazing capacity of the area that will be affected by the proposed project.
The following assumptions have been made in the calculations:

- The total area under grazing is equivalent to the occurring soils of the Mispah/Glenrosa soil form, which is 185.50 ha.
- At a long-term average grazing capacity of 4 hectares per Large Stock Unit (/ha/LSU) (DAFF, 2018), the 185.50 ha area provides forage to 46 head of cattle.
- The herd is assumed to wean at an optimistic 70% rate, excluding stocks stolen or unforeseen circumstances. This allows for the sale of around 32 weaners per annum.
- The average weight of a weaner, sold at an auction is estimated at 220 kg and the price of a weaner in the past year is R55/kg (According to the Red Meat Producers Organisation).
- Therefore, the total gross income from livestock farming in the past year can be estimated to be R387 200 (excluding the production costs).

It is envisaged that the study area will lose economic yield during the lifespan of the proposed solar facility. However, farming enterprises can generate reliable income by leasing the land to the energy facility. This will likely increase their cash flow and financial security and improve farming operations.

### 5.5 Impact Statement and Screening tool verification

The active pastures within the study area are critical for livestock farming and are important from an agricultural standpoint. According to the desk-based assessment (i.e., sourced from the Natural Agricultural Resource Atlas of South Africa database), the grazing capacity for this area is 4 Hectares per livestock unit, which is considered adequate for large-scale farming. Also, the transformation of the shallower soils identified in the study area into maize cultivation and can also be considered critical from an agricultural viewpoint. As such, this presents a constraint for this project.

In spite of the fact that agricultural soils will be lost and land will be temporarily altered (for the duration of the lifespan of the project) within the study area, the cumulative loss of agricultural resources at local and regional levels will be moderate without mitigation, while moderately low with mitigation. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of grazing land since it is the dominant land use within the study area. As a result, integrated mitigation measures must be implemented to minimize potential soil losses, considering the need for sustainable development. Mixed land use, such as cattle grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy. That said, for

South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a minimal loss of agricultural land on a site such as the one being assessed, which has marginal cultivation potential based on inherent soil properties, than to lose agricultural land that has a higher potential and that is much scarcer, to renewable energy development elsewhere in the country.

The screening tool analysis was conducted, which presented the findings as the impact on agricultural resources being of high sensitivity in terms of agricultural potential. Based on the outcomes of the field assessment, high-potential, this was found to have a less significant impact as presented on the screening tool due to the dominant soil forms that are not high potential agricultural soils due to various limitations, including shallower depth and requiring intensive management strategies to cultivate. The land capability of the surrounding soils as well as the agricultural potential, are very low to moderate due to adequate climatic conditions (i.e., rainfall, temperature) and appropriate slope, which allows for intensive commercial agricultural practices. The allocated sensitivities for the agricultural theme are presented in Table 11 below.

Table 11: Summary of the screening tool vs specialist-assigned sensitivities.

| SITE SENSITIVITY VERIFICATION | | | |
|---|---|---|---|
| | Screening Tool | | Site Verification Outcome |
| Renewstable Sevutse Study Area | High Sensitivity | | Moderate Sensitivity |

It is the opinion of the specialist that this study provides the relevant information required for the Environmental Impact Assessment phase of the project to ensure that appropriate consideration of the agricultural resources in the study area are made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

### 5.6 Consideration of Renewable Development Zones

The South African Renewable Energy EIA application database (SA REEA) identifies the boundaries for the known renewable energy project within a 50 km radius of the study area. Thus, this information was used to consider renewable energy projects' overall potential cumulative impacts. These projects are presented in Table 10 below.

Table 12: Known renewable energy projects within a 50 km radius of the proposed Renewstable Sivutse solar facility.

| Project Title | DEA_REF | NEAS_REF | APPLICANT |
|---|---|---|---|
| Proposed construction of a 75 MW Solar (PV) electricity installation on various portions of the Farm Grootvlei No 453 IR Dipaleseng Local Municipality, Mpumalanga Province. | 12/12/20/2060 | DEA/EIA/0000065/2011 | Clare Energy and Habitat Pty Ltd |
| Proposed 65MW solar PV facility at Majuba Power Station in Mpumalanga Province. | 14//12/16/3/3/2/752 | DEA/EIA/0002665/2015 | Eskom Holdings SOC Limited |
| 65 MW Majuba Photovoltaic (PV) Energy Facility and Its associated Infrastructure on portions 1, 2, and 6 of the farm Witkoppies 81 Hs, Amersfoort, within the Dr Pixley Ka Seme Local Municipality, Mpumalanga Province. | 14/12/16/3/3/2/752 | DEA/EIA/0002665/2015 | Eskom Holdings SOC Limited |
| 65.9 MW Tutuka Photovoltaic (PV) Energy Facility and Its associated Infrastructure on portions 4, 10, 11, and 12 of the Farm Pretorius Vley 374 is near Standerton within Lekwa, Mpumalanga Province. | 14/12/16/3/3/2/754 | DEA/EIA/0002646/2014 | Eskom Holdings SOC Limited |

## 6. CONCLUSION

Nsovo Environmental Consulting was appointed by Hydrogen de France (HDF) to conduct the soil, land use, and land capability study as part of the Environmental Impact Assessment (EIA) process for the proposed Renewstable power plants and associated infrastructure (Hydrogen Power Centre) within portion 4 and 5 of the farm Rietfontein 66-HS and portion 34 of the farm Bergvliet in the province of Mpumalanga, South Africa (henceforth referred to as study area). The proposed Renewstable power plants will be Distributed over six different plots within Tutuka and Majuba Coal Power Stations.

The study area is within a subtropical highland climate or Monsoon-influenced temperate oceanic climate. This climate is characterised by cold, dry winters and warm, wet summers. The summers experience heavy precipitation due to the presence of unstable humid air masses that encourage thunderstorm development. The mean annual rainfall ranges between 601 and 800 mm, which is considered sufficient to support rainfed agriculture. However, it is important to carefully consider the planting dates and the length of the growing season, as they may be affected.

The development footprint presents areas of active pasture utilised for grazing purposes, and some grass is harvested and used for stall feeding. These areas are critical for the livestock farming taking place within the study area and are regarded as important from an agricultural point of view. According to the desk-based assessment (i.e., sourced from the Natural Agricultural Resource Atlas of South Africa database), the grazing capacity for this area is 4 Hectares per livestock unit, which is considered adequate for large-scale farming. It was also evident during the site verification that the grazing land was utilised for fodder, which means that these areas are actively used for large-scale purposes. As such, this presents a constraint for this project.

The loss of agricultural soils and the long-term change in land use will be localised within the study area. The integrated mitigation measures must be implemented accordingly, to minimise the potential loss of these valuable soils, considering the need for sustainable development.

In spite of the fact that agricultural soils will be lost and land will be temporarily altered (for the duration of the lifespan of the project) within the study area, the cumulative loss of agricultural resources at local and regional levels will be moderate without mitigation, while moderately low with mitigation. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of grazing land since it is the dominant land use within the study area. As a result, integrated mitigation measures must be implemented to minimize potential soil losses, considering the need for sustainable development. Mixed land use, such as cattle grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy. That said, for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a minimal loss of agricultural land on a site such as the one being assessed, which has marginal cultivation potential based on inherent soil properties, than to lose agricultural land that has a higher potential and that is much scarcer, to renewable energy development elsewhere in the country.

The screening tool analysis was conducted, which presented the findings as the impact on agricultural resources being of high sensitivity in terms of agricultural potential. Based on the outcomes of the field assessment, this was found to have a less significant impact as presented on the screening tool due to the dominant soil forms that are not high potential agricultural soils due to various limitations, including shallower depth and requiring intensive management strategies to cultivate. The land capability of the surrounding soils as well as the agricultural potential, are very low to moderate due to adequate climatic conditions (i.e., rainfall, temperature) and appropriate slope, which allows for intensive commercial agricultural practices.

It is the opinion of the specialist that this study provides the relevant information required for the Environmental Impact Assessment phase of the project to ensure that appropriate consideration of the agricultural resources in the study area are made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

## 7. REFERENCES

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## APPENDIX A: INDEMNITY

- This report is based on survey and assessment techniques, limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data on the site to be affected, in situ fieldwork, surveys, assessments, and the specialist's best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions, and recommendations given in this report are based on the specialist's best scientific and professional knowledge and information available at the time of the study.
- Additional information may become known or available later in the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations, and conclusions at any stage should additional information become available.
- Information and recommendations in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, confirms acknowledgment of these terms and liabilities.

Tshiamo Setsipane

18 September 2024

## APPENDIX B: IMPACT ASSESSMENT METHODOLOGY

The assignment of significance ratings has been undertaken based on the experience of the EIA team, as well as through research. Subsequently, mitigation measures were identified and considered for each impact, and the assessment was . The assessment is repeated to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented).

### Status of Impact

- The impacts are assessed as either having a:
- The negative effect (i.e., at a `cost' to the environment),
- positive effect (i.e., a `benefit' to the environment) or
- Neutral effect on the environment.

### Extent of the Impact

- (1) Site (site only),
- (2) Local (site boundary and immediate surrounds),
- (3) Regional (within the project area),
- (4) National, or
- (5) International.

### Duration of the Impact

The length that the impact will last is described as either:

- (1) immediate (<1 year)
- (2) short term (1-5 years),
- (3) medium term (5-15 years),
- (4) long-term (ceases after the operational life span of the project),
- (5) Permanent.

### Magnitude of the Impact

The intensity or severity of the impacts is indicated as either:

- (0) none,
- (2) Minor,
- (4) Low,
- (6) Moderate (environmental functions altered but continue),
- (8) High (environmental functions temporarily cease), or
- (10) Very high / Unsure (environmental functions permanently cease).

### Probability of Occurrence

The likelihood of the impact actually occurring is indicated as either:

- (0) None (the impact will not occur),
- (1) improbable (probability very low due to design or experience)
- (2) low probability (unlikely to occur),
- (3) medium probability (distinct probability that the impact will occur),
- (4) high probability (most likely to occur), or
- (5) Definite.

### Significance of the Impact

Based on the information contained in the points above, the potential impacts are assigned a significance rating (S). This rating is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact.

S=(E+D+M) P

### The significance ratings are given below.

(<30) low (i.e., where this impact would not have a direct influence on the decision to develop in the area),

(30-60) medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),

(>60) high (i.e., where the impact must influence the decision process to develop in the area).

### Assessment Of Impacts

The following section presents the impacts, and the significance as rated by the specialists as well as the EAP. The Tables below highlight the significance of the identified impacts for both the construction and operational phases of the proposed development.

The impacts are assessed according to the criteria outlined below. Each issue is ranked according to extent, duration, magnitude (intensity), and probability. From these criteria, a significance rating is obtained, the method and formula is also described below. Mitigation measures and recommendations have been made and are presented in tabular form below.

The ratings are assessed with and without mitigation and color-coded as follows to indicate the significance:

| | |
|---|---|
| High | >60 |
| Medium | >30 - 60 |
| Low | <30 |

| Issue | Corrective measures | Impact rating criteria | | | | | Significance |
|---|---|---|---|---|---|---|---|
| | | Nature | Extent | Duration | Magnitude | Probability | |
| Construction Phase: | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Mitigation Measures | | | | | | | |
| | | | | | | | |
| Operational Phase | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Mitigation Measures | | | | | | | |
| | | | | | | | |

APPENDIX C: CURRICULUM VITAE OF SPECIALISTS

CURRICULUM VITAE OF TSHIAMO SETSIPANE

## PROFESSIONAL EXPERIENCE

### Soil Science Consultant

- Conducting Soil, Land Use and Land Capability Assessments:
  - Assess existing information for rainfall data and current land uses.
  - Conduct a desktop assessment within the study area using digital satellite imagery and other suitable digital aids.
  - A soil classification survey and agricultural potential will be conducted within the proposed development area.
  - A soil classification survey and agricultural potential will be conducted within the proposed development area.
  - Provide recommended mitigation measures to manage the anticipated impacts and comply with the applicable legislations.
  - Compile a report on the findings of the assessment and presented in an electronic format.
- Conducting Hydropedological Impact Surveys:
  - Identify dominant hillslopes (from crest to stream) of the project area using terrain analysis.
  - Conduct a transect soil survey on each of the identified hillslope.
  - Hydrological behaviour of the identified hillslope described according to the identified hydropedological groups;
  - Graphical representation of the dominant and sub-dominant flow paths at hillslope scale prior to development and post development.
  - The impact of the proposed development on the hydropedological behaviour described in a report format.
  - Quantification of hydropedological fluxes using the Soil and Water Analysis Tool (SWAT+) to determine the losses to the wetland systems though the proposed project.
- Conducting Land Contamination Assessments and Soil Monitoring Assessments:
  - Assessments of historic and current storage of hazardous waste and materials on soils.
  - Topsoil stockpile quality assessment for future usage.
  - Monitoring programme to determine the dust suppression impact on soil chemical parameters.

## EDUCATION

- M.Sc. (Agric): Soil Science 01/2016– 03/2019

- Dissertation: Characterisation of hydropedological processes and properties of a sandstone and a tillite hillslope, Kwa-Zulu Natal, South Africa.
- Graduated *Cum-Laude*.

- B.Sc. (Agric) Honours: Soil Science **01/2014 – 11/2014**
  - Majored in soil fertility, soil physics, soil geography and soil chemistry.
  - Research Project: Soil as an indicator of soil water regime.
- B.Sc. (Agric): Soil Science and Agrometeorology **2010 – 11/2013**
  - Majored in soil science and agrometeorology.
  - Minored in agronomy and plant pathology.

PROFESSIONAL MEMBERSHIP AND AFFILIATION

- Professional Natural Scientist with South African Council for Natural Scientific Professions (SACNASP) Registered, 11/2015 – Current
- Member of the Soil Science Society of South Africa (SSSSA)
- Member, South African Soil Surveyors Organization (SASSO)
- Member of the South African Wetland Society (SAWS)