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# IMPACT ASSESSMENT REPORT - SOILS AND AGRICULTURAL POTENTIAL ASSESSMENT FOR THE PROPOSED ROOS SOLAR PV PROJECT, MPUMALANGA PROVINCE

**Date**
*21st of July 2023*

**Client**

*SiVEST Environmental*

# SPECIALIST ASSESSMENT DETAILS & DECLARATION OF INDEPENDENCE

| | | |
|---|---|---|
| **Document Title** | **IMPACT ASSESSMENT REPORT - SOILS AND AGRICULTURAL POTENTIAL ASSESSMENT FOR THE PROPOSED ROOS SOLAR PV PROJECT, MPUMALANGA PROVINCE** | |
| **Report No.** | **W91** | |
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| **Date** | **21st of July 2023** | |
| **Report completed by** | **Wayne Jackson** *Cert.Sci.Nat. (Registration 119037)* | |
| **Client** | **SiVEST Environmental Division** | |
| **Fieldwork and Report Writing** | **Wayne Jackson** | |

I, Wayne Jackson, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Environmental Affairs.

Wayne Jackson

Wetland & Soils Specialist

Eco-Assist

21st July 2023

# Specialist Details

| Specialist | Role | Details |
|---|---|---|
| **Wayne Jackson** *Cert.Sci.Nat. (Registration 119037)* | **Field work and author (Soils)** | Wayne Jackson graduated from the University of KwaZulu-Natal, Pietermaritzburg, with a BSc. degree in Soil Science & Hydrology.<br><br>Wayne has 14 years' experience in Wetlands & Soils Scientist with a demonstrated history of working in the environmental services industry. He is skilled in Soil Classification, Wetlands, Hydropedology, and Surface Water Hydrology. He has a strong Environmental mitigation and rehabilitation knowledge. He has also gained experience in large post-mining rehabilitation projects, providing specialist inputs on land capability and soil utilisation. He has extensive exposure to a wide range of projects in many sectors across South Africa, and parts of Africa. He is knowledgeable on how soils, wetlands, and hydrological systems are linked in the landscape and how activities could impact all these aspects.<br><br>Wayne is a registered Natural Scientist with the South African Council for Natural Scientific Professionals (SACNASP) – Registration No. 119037. |

The relevant experience of specialist team members involved in the compilation of this report are briefly summarized above. Curriculum Vitae of the specialist team are available on request.

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# 1 INTRODUCTION

Eco-Assist Environmental Consultants (here after Eco-Assist) were appointed by SiVEST to conduct the Soils and Agricultural Potential Assessment for the proposed Roos Solar PV Project, Mpumalanga Province.

In accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a site sensitivity verification has been undertaken (Assessment Protocols published in GN 320 on 20 March 2020) in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

## 1.1 Project Background

JUWI South Africa (Pty) Ltd (hereafter referred to as "JUWI"), has appointed SiVEST SA (Pty) Ltd (hereafter referred to as "SiVEST") to undertake the required Environmental Processes for the proposed renewable energy facility, located on various land parcels in the western part of Mpumalanga, in the Emakhazeni Local Municipality.

The proposed development is envisioned to be a 50 MW solar PV facility and a grid connection infrastructure to facilitate the PV connection to the national grid. The PV and grid infrastructure will be authorized through a single application for Environmental Authorisation (EA). The distinct components are as follows (Refer to Figure 1-2):

- Roos Solar PV;
- Roos Electrical Grid Infrastructure.

Refer to the table below for the key project information. The cluster consists of the following:

| TECHNICAL DETAILS | |
|---|---|
| PV panels | • Mounting: Fixed-tilt PV, single-axis tracking PV or double-axis tracking PV.<br>• Module type: mono- or bi-facial<br>• up to approx. 3.5m PV panels |
| Access roads | • Main site access: Up to 8m, during construction and operation<br>• Internal roads: Approx. 4 - 5m, during construction and operation<br>• Existing roads will be utilised as far as reasonably possible and upgraded where necessary. Upgraded width: Up to 8m. |
| On-site Substation | • Main site access: Up to 8m, during construction and operation<br>• Internal roads: Approx. 4 - 5m, during construction and operation |

| | |
|---|---|
| | • Existing roads will be utilised as far as reasonably possible and upgraded where necessary. Upgraded width: Up to 8m. |
| Construction camp | • No construction camps would be developed, and labour would be sourced from nearby areas, as per relevant procurement requirements. |
| Temporary construction laydown / staging area | • Temporary Laydown Area: up to approximately 7 ha.<br>• Locations: TBC |
| Operation and Maintenance (O&M) buildings | • All Auxiliary buildings to be developed include, but are not limited to: O&M building, site office, staff lockers, bathrooms, warehouses, etc.<br>• Footprint up to 0.5 ha (i.e., 5000 m2) Height (m): Up to 10 m |
| On-site IPP Electrical infrastructure | • "Cables will be laid underground wherever technically feasible, with overhead 33kV lines grouping PV areas to crossing valleys and ridges to get to the on-site substation."<br>• The proposed project will include one on-site substation hub incorporating the facility substation, switchyard, collector infrastructure, battery energy storage system (BESS) and associated O&M buildings.).<br>• Internal underground lines of up to 33 kV (22kV or 33kV).<br>• Substation will generally be stepping up from 22kV or 33kV to 88kV or 132kV.<br>• Depth (m): Up to 1.5 m |
| Fencing | • Height: Up to 3m<br>• The entire perimeter of the proposed facility will be secured.<br>• Length: TBC<br>• Type: Could be Palisade or mesh or fully electrified |
| Boreholes and storage tanks (if applicable) | • If required, a 10,000l storage tank may be located on site for water storage. |
| Battery Energy Storage Systems | • Capacity in MWh: Up to 500MW/ 500MWh<br>• Size in hectare - A BESS would be developed within the substation/electrical infrastructure hub footprint, if required.<br>• Height: Up to 8 m.<br>• Technology type (i.e.: Li-Ion solid state/Redox flow).<br><br>Electrochemical Batteries including: |

| | |
|---|---|
| | a) Lead Acid and Advanced Lead Acid<br>b) Lithium ion, NiCd, NiMH-based Batteries<br>c) High Temperature (NaS, Na-NiCl2, Mg/PB-Sb)<br>d) Flow Batteries (VRFB, Zn-Fe, Zn-Br)<br><br>The BESS would therefore comprise the selected batteries together with chargers, inverters and related equipment. |
| Estimated number of employment opportunities generated by each PV project | • Construction phase: 100 (skills split would be in line with applicable procurement requirements but would be roughly 60% low-skilled, 25% semi-skilled and 15% skilled)<br>• Operational phase: 10 (skills split would be in line with applicable procurement requirements but would be roughly 70% low skilled, 25% semi-skilled and 5% skilled<br>• Decommissioning phase: unknown |
| Construction: Methodology | • The facility would be constructed in the following sequence:<br><br>1. Final design and micro-siting of the infrastructure based on topographical conditions and environmental sensitivities and following obtaining required environmental permits.<br>2. Vegetation clearance and construction of access roads (where required)<br>3. Construction of foundations<br>4. Assembly and erection of infrastructure on site<br>5. Stringing of inverters<br>6. Rehabilitation of disturbed areas<br>7. Continued maintenance |
| Construction: Duration and start date | Up to 12-18 months, start date is dependent upon award of a bid. Construction activities could take place concurrently. |

## 1.2 Project Locality

The proposed project area is located approximately 13km South-West of Belfast in the Mpumalanga province. The study area is presented in Figure 1-1 and Figure 1-2.

The project will be located on various land parcels located in the western part of Mpumalanga, in the Emakhazeni Local Municipality. The land parcels for the entire hybrid facility are listed below:

- RE of the Farm Leeuwbank No 427.
- Portion 3 of the Farm No 426.
- Portion 4 of the Farm Leeuwbank No 427.
- Portion 5 of the Farm Leeuwbank No 427.
- Portion 6 of the Farm Zoekop No 426.
- Portion 8 of the Farm Wintershoek No 423.

- Portion 8 of the Farm Wintershoek No 390.
- Portion 9 of the Farm Wintershoek No 390.
- Portion 9 of the Farm Zoekop No 426.
- Portion 14 of the Farm Generaalsdraai No 423.
- Portion 16 of the Farm Zoekop No 426.
- Portion 17 of the Farm Leeuwbank No 427.
- Portion 19 of the Farm Leeuwbank No 427.
- Portion 38 of the Farm Leeuwbank No 427.

The site is located within the Renewable Energy Development Zone (REDZ) but outside the Power Corridor.

The PV will be located on the portions of the properties not used for wind energy development. So far these are in the west of the area with an overall 270Ha of the PV development area which should be authorised. The associated infrastructure would include a BESS, site camp, substation and OHL, and O&M Building and a 132kV OHL route. Based on the desktop analysis, the focus area for the PV development is in the western section of the property.

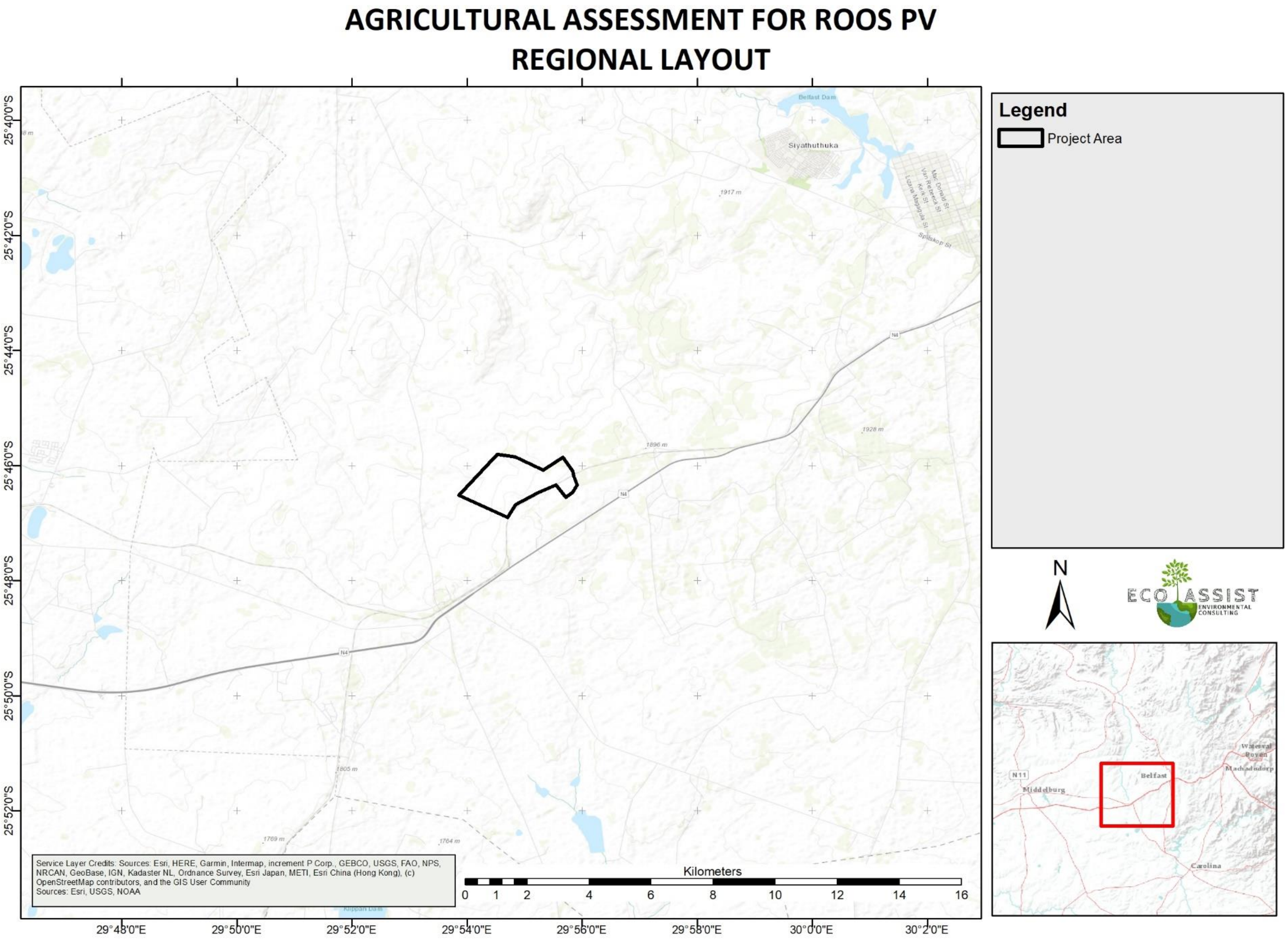


*Figure 1-1: Regional setting of the study.*

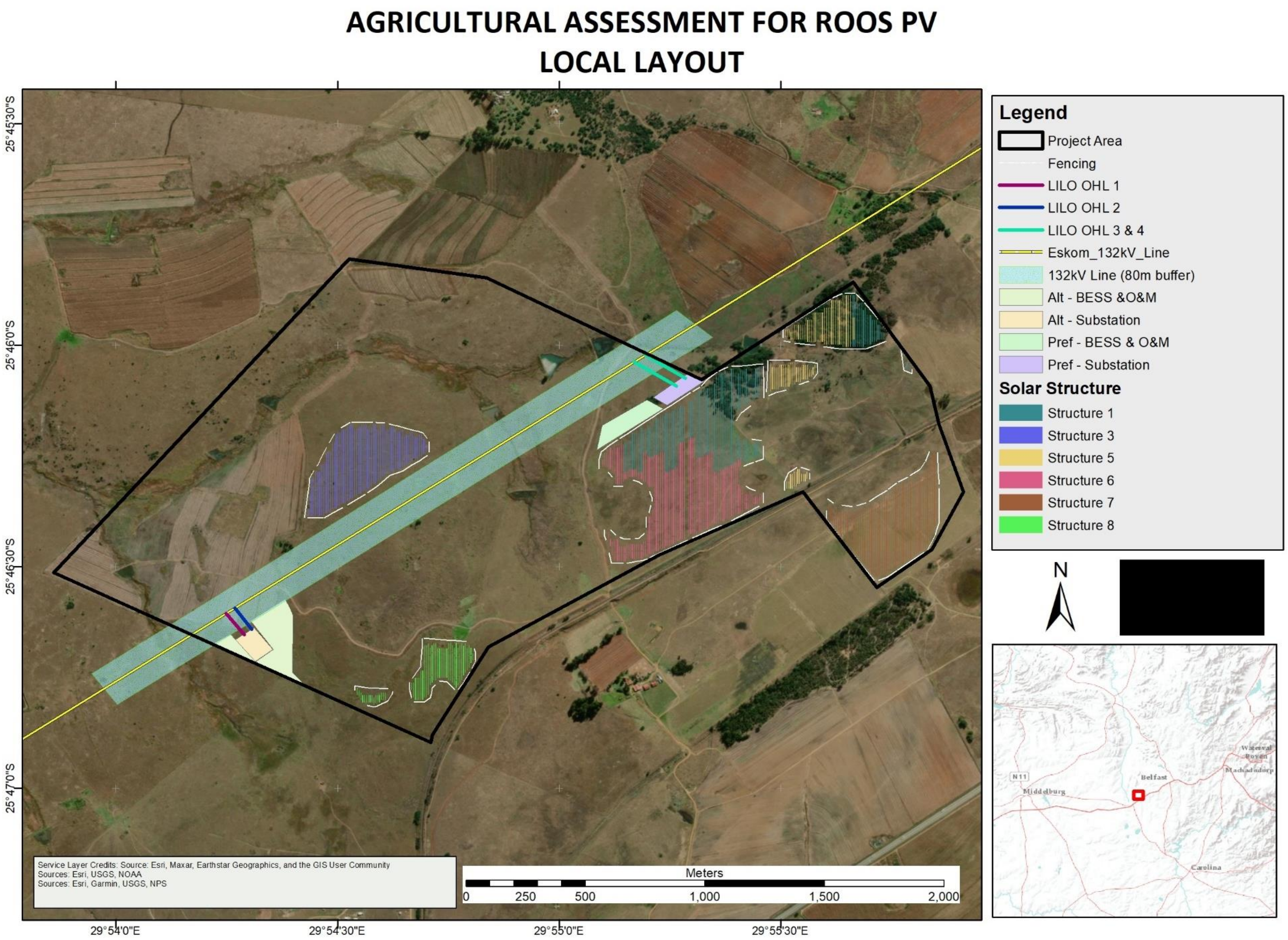


*Figure 1-2: Project layout for the Roos PV project area.*

# 2 TERMS OF REFERENCE

SiVEST requires that a soil survey be conducted and that the following be assessed as per the Provincial and National Departments of Agriculture recommendations:

- Assess and discuss historic climate statistics;
- Assess and discuss geological information;
- Assess and discuss the terrain features using 5m contours;
- Source best recent satellite or aerial imagery and georeferenced;
- Assess and discuss current agricultural land use on site and comment on crop performance and estimated yields (if any);
- Conduct soil assessment as described in the methodology;
- Assess and discuss agricultural land potential (eight class scale);
- Discuss the impact of the proposed land use change on loss of agricultural land production (If any);
- Recommend best location for proposed development to reduce any impacts;
- Compile informative reports and maps on current land use and agricultural land potential;
- Discuss the impact of the proposed land use change on loss of agricultural land production; and
- A basic soil management guideline will be completed.

The results will be mapped in GIS format and will include the following maps:

- A soil distribution map;
- A current land use map; and
- An agricultural potential map.

An Impact assessment of the proposed development will be conducted, and the recommendations can be used in the Environmental Management Plan (EMP).

# 3 KEY LEGISLATION

Relevant environmental legislation pertaining to the soil/agricultural resources in South Africa is listed below, but is not limited to:

***<u>The Constitution of the Republic of South Africa Act, 108 of 1996</u>***

The new Constitution of South Africa was published on 18 December 1996. It is regarded as the supreme law of the country and any law that is inconsistent with the Constitution is regarded as invalid.

Chapter 2 of the Constitution consists of the Bill of Rights. Section 24 of the Bill of Rights in the Constitution stipulates that -

"Everyone has the right -

a) To an environment that is not harmful to their health or well-being and
b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that –
   (i) Prevent pollution and ecological degradation;
   (ii) Promote conservation; and
   (iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social developments".

Section 27 of the Bill of Rights focuses on health care, food, water and social security, stipulating that -

"(1) Everyone has the right to have access to -

(a) Health care, including reproductive health care;
(b) Sufficient food and water; and
(c) Social security, including, if they are unable to support themselves and their dependants, appropriate social assistance.

(2) The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realization of each of these rights".

***Conservation of Agricultural Resources Act, 43 of 1983 (CARA)***

This Act is one of the principal legislations governing the protection of natural agricultural resources. The Act was assented on 21 April 1983 and came into effect on 1 June 1984. The main aim of the Act is to control the utilization of natural agricultural resources to ensure the conservation of soil, water and vegetation, as well as the combating of alien and invasive plants. According to Section 1, conservation of natural agricultural resources includes the protection, recovery as well as the reclamation thereof. Urban areas are excluded from the provisions of the Act, with the exception of the regulation of weeds and invasive plants.

The CARA Act is a replacement of the Soil Conservation Act, 76 of 1969. The objects of the Soil Conservation Act were to make provision for the combating and prevention of soil erosion and for the conservation, protection and improvement of the soil, the vegetation and the sources and resources of the water supplies of the Republic.

In an effort to conserve the country's natural heritage, especially the agricultural land, Act 43 of 1983 strives to act against any individual that deliberately misuses the natural resources. It provides control measures for the cultivation of virgin soil (soil that has not previously been cultivated or not cultivated for at least ten years), the utilization and cultivation of land, including irrigated land, and the protection of water sources such as vleis (marshes, small lakes) and wetlands. It also includes control measures on the use of water to prevent water logging and regulate water flow patterns, the protection of vegetation, grazing potential of the veld, prevention of erosion and land degradation, construction and management of soil conservation structures, as well as the combating of weeds and invasive plants.

***Sub-division of Agricultural Land Act, 70 of 1970 (SALA)***

The Sub-division of Agricultural Land Act (SALA) was assented on 28 September 1970 and commenced on 2 January 1971. The main objective of this Act is to manage the sub-division of agricultural land to prevent injudicious fragmentation of agricultural land and the creation of uneconomical units and to also manage and retain the use of agricultural land for agricultural production purposes.

Actions that the Act regulates include:

- Sub-division of agricultural land.
- Transfer of agricultural land into undivided shares.
- Leasing of agricultural land for periods longer than 10 years.
- The registration of a servitude over agricultural land if wider than 15 metres.
- The registration of a usufruct or right of *habitatio* over agricultural land.
- Establishment or extension of a township.
- Registration of a share block scheme and a sectional title scheme.

The above is supported by additional legislation that aims to manage the impact of development on the environment and the natural resource base of the country. Related legislation to this effect includes:

- Environment Conservation Act (Act 73 of 1989);
- National Environmental Management Act (Act 107 of 1998); and
- National Water Act (Act 36 of 1998).

# 4 SENSITIVITY ANALYSIS BASED ON THE ENVIRONMENTAL SCREENING TOOL

## 4.1 Screening Assessment

### 4.1.1 Solar PV Areas

The result of the Department of Forestry, Fisheries and the Environment (DFFE) screening tool for the Agricultural sensitivities for the Roos Solar PV project is shown in Figure 4-1. The screening tool was accessed on $15^{th}$ of June 2023 by Wayne Jackson.

The results show that the Roos Solar PV project area is deemed as Medium to Low sensitivity. Isolated raster cells do show patches of High sensitivity, but these are considered negligible. The Western corner of the project area has a small portion which was rated as High, which aligns with the maize field on that portion of land.

The DFFE screening tool must be used as a guideline, and it is up to the specialists to verify these results in the field. The screening tool is based on coarse datasets and at times may not be accurate.

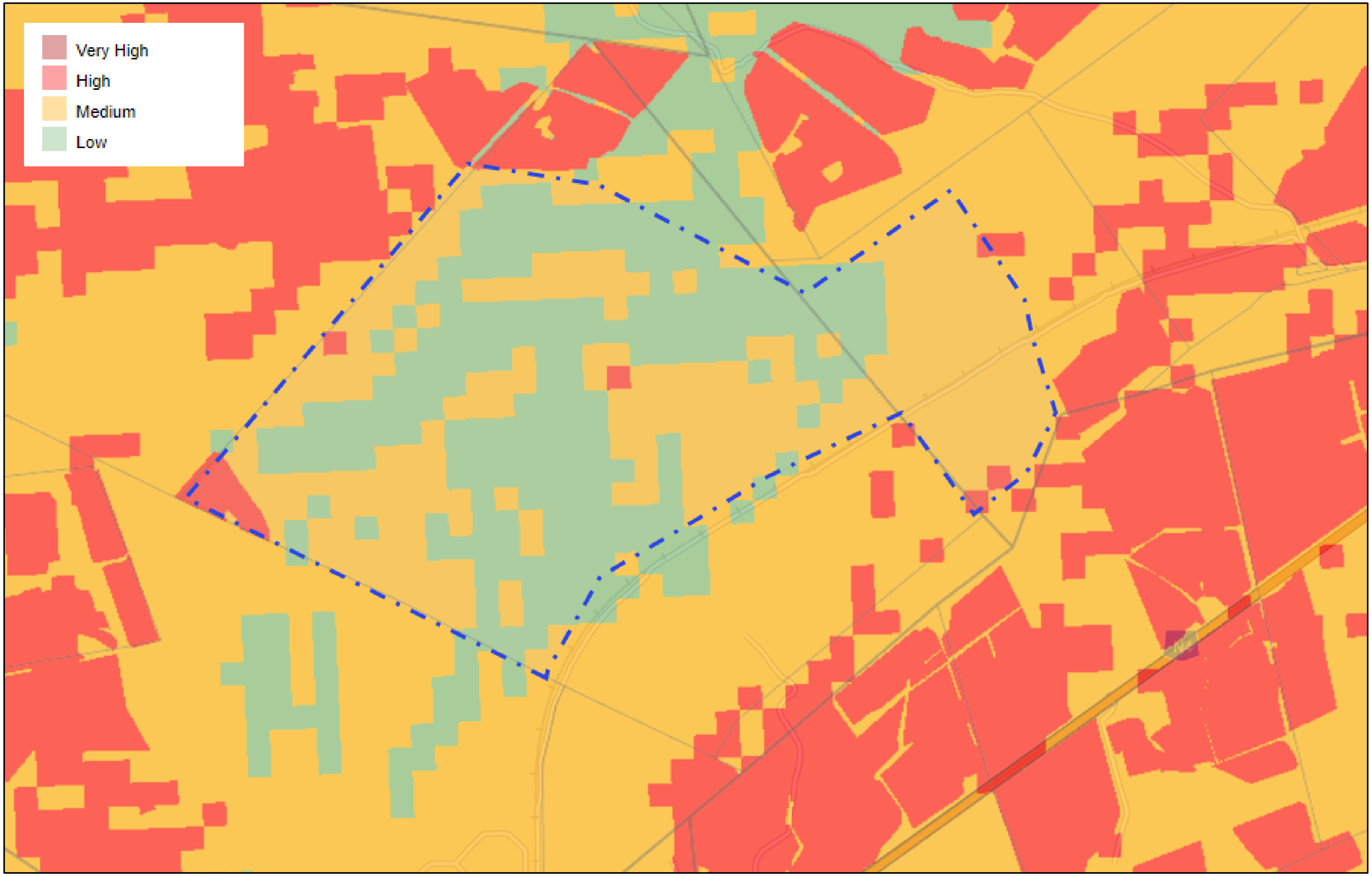


*Figure 4-1: DFFE screening tool results for the agricultural sensitivity theme of the Roos Solar PV project (PV Areas Only).*

## 4.2 Site Sensitivity

The site sensitivity was based on the combination of the desktop datasets described in the previous sections of the report and the field verification findings. Agricultural infrastructure, such as farm dams were rated as having a high sensitivity. All areas currently under agricultural production was also considered as having a high sensitivity.

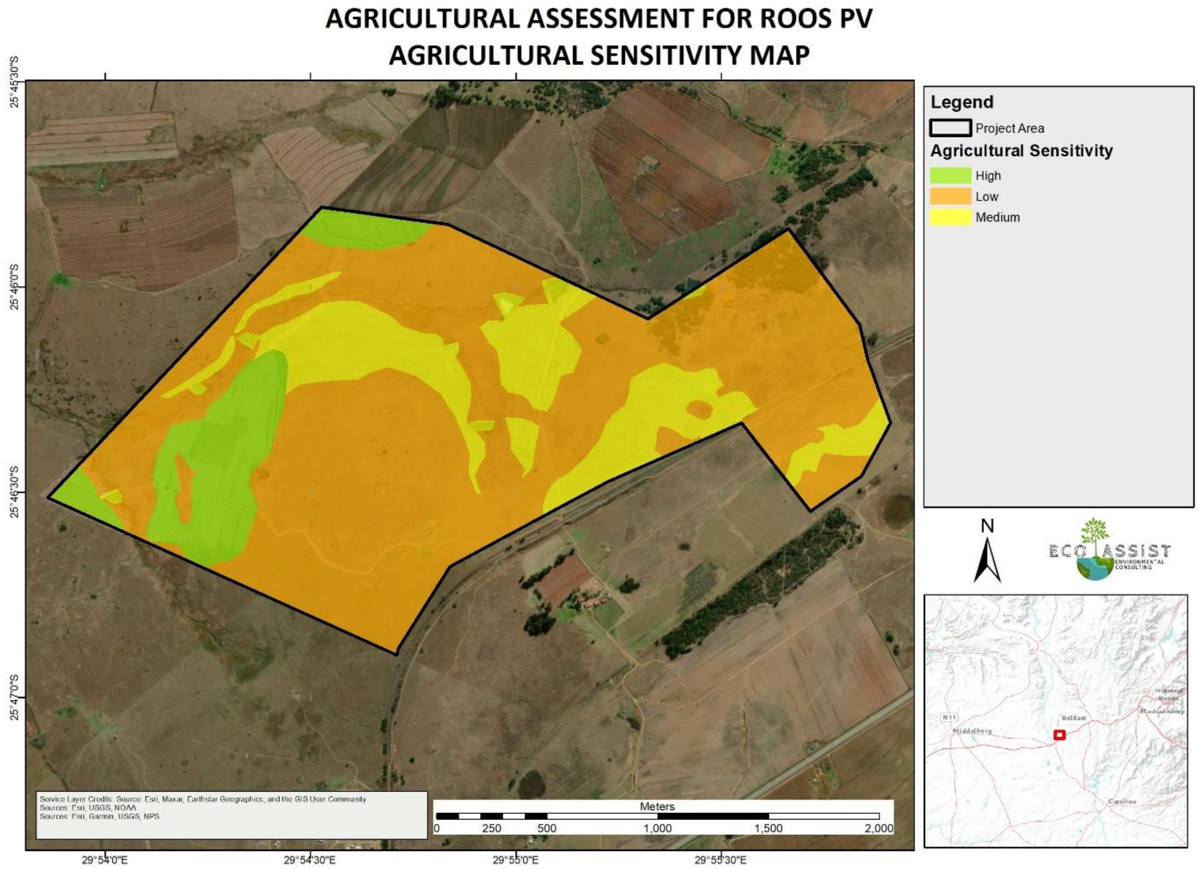


*Figure 4-2: The site sensitivity for the Roos PV project area.*

## 4.3 Outcome of Site Sensitivity Verification

Therefore, the specialist finds that the site sensitivities of Medium to Low is correct for the majority of the project area. The area to the west does however have areas that are currently being utilised for agriculture and therefore these areas dispute the DFFE rating of Medium to Low. Therefore, the project area does have the potential to be of a high sensitivity in these areas. The assessment would require an Agro-ecosystem impact assessment.

# 5 METHODOLOGY

## 5.1 Desktop Assessment

The following data layers were assessed to determine whether the development could have an impact on important national & provincial feature:

- Aerial imagery (Google Earth™);
- Land Type Data (Land Type Survey Staff, 1972 - 2006);
- Topographical data;
- Contour data (5 m)

## 5.2 Field Procedure

The site was traversed by vehicle and on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1.5 m. Soil survey positions were recorded as waypoints using a GPS device.

Soils were identified to the soil family level as per the "Soil Classification: A Natural and Anthropogenic System for South Africa" (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

## 5.3 Land Capability Assessment

Land capability and agricultural potential is determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes (Smith, 2006).

The climate capability classification is described in Table 5-1 which is calculated as shown in the following sections.

*Table 5-1: The descriptions of climatic capability classes (Smith, 2006).*

| Climate capability class | Limitation rating | Description |
|---|---|---|
| **C1** | None to slight | Local climate is favourable for good yields for a wide range of adapted crops throughout the year. |
| **C2** | Slight | Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperatures increase risk and decrease yields relative to C1 |
| **C3** | Slight to moderate | Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops. |

| | | |
|---|---|---|
| **C4** | Moderate | Moderately restricted growing season due to low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3 |
| **C5** | Moderate to severe | Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss. |
| **C6** | Severe | Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss. |
| **C7** | Severe to very severe | Severely restricted choice of crops due to heat, cold and/or moisture stress. |
| **C8** | Very severe | Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss. |

Land capability is divided into eight (8) classes, and these may be divided into three (3) capability groups. Table 5-2 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

*Table 5-2: Land capability class and intensity of use (Smith, 2006).*

| **Land Capability Class** | **Increased Intensity of Use** | | | | | | | | | **Land Capability Groups** |
|---|---|---|---|---|---|---|---|---|---|---|
| I | W | F | LG | MG | IG | LC | MC | IC | VIC | Arable Land |
| II | W | F | LG | MG | IG | LC | MC | IC | | |
| III | W | F | LG | MG | IG | LC | MC | | | |
| IV | W | F | LG | MG | IG | LC | | | | |
| V | W | N/A | LG | MG | | | | | | Grazing Land |
| VI | W | F | LG | MG | | | | | | |
| VII | W | F | LG | | | | | | | |
| VIII | W | | | | | | | | | Wildlife |

W - Wildlife | MG - Moderate Grazing | MC - Moderate Cultivation

F- Forestry | IG - Intensive Grazing | IC - Intensive Cultivation

LG - Light Grazing | LC - Light Cultivation | VIC - Very Intensive Cultivation

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 5-3. The final land potential results are then described in Table 5-4.

*Table 5-3: The combination table for land potential classification.*

| Land capability class | Climate capability class | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
| I | L1 | L1 | L2 | L2 | L3 | L3 | L4 | L4 |
| II | L1 | L2 | L2 | L3 | L3 | L4 | L4 | L5 |
| III | L2 | L2 | L3 | L3 | L4 | L4 | L5 | L6 |
| IV | L2 | L3 | L3 | L4 | L4 | L5 | L5 | L6 |
| V | Vlei | Vlei | Vlei | Vlei | Vlei | Vlei | Vlei | Vlei |
| VI | L4 | L4 | L5 | L5 | L5 | L6 | L6 | L7 |
| VII | L5 | L5 | L6 | L6 | L7 | L7 | L7 | L8 |
| VIII | L6 | L6 | L7 | L7 | L8 | L8 | L8 | L8 |

*Table 5-4: The Land Potential Classes.*

| Land potential | Description of land potential class |
|---|---|
| L1 | Very high potential: No limitations. Appropriate contour protection must be implemented and inspected. |
| L2 | High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected. |
| L3 | Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected. |
| L4 | Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land. |
| L5 | Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. |
| L6 | Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable |
| L7 | Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable |
| L8 | Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable |

# 6 LIMITATIONS

The following aspects were considered as limitations of the assessment:

- Hand augers were used, and the limiting layer was the depth to which the auger could drill;
- The assessment is based on the design and layout information provided by the client;
- It has been assumed that the extent of the development area provided by the responsible party is accurate;
- The GPS used for ground truthing is accurate to within five meters. Therefore, the observation site's delineation plotted digitally may be offset by up to five meters to either side; and
- Only a soil auger was used for this assessment, no open pits were dug.

# 7 RESPONSES TO INTERESTED AND AFFECTED PARTIES

To this point no concerns have been raised as ye. If any concerns are raised with regards to the agricultural impact assessment it will be address in this report.

# 8 RESULTS FROM DESKTOP ASSESSMENT

## 8.1 Climate

This region is characterised by a strongly seasonal summer rainfall, with very dry winters. Mean annual precipitation (MAP) 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations, see Figure 8-1 (Mucina, et al., 2006). The regional climate capability was classified as Moderate see Figure 8-2.

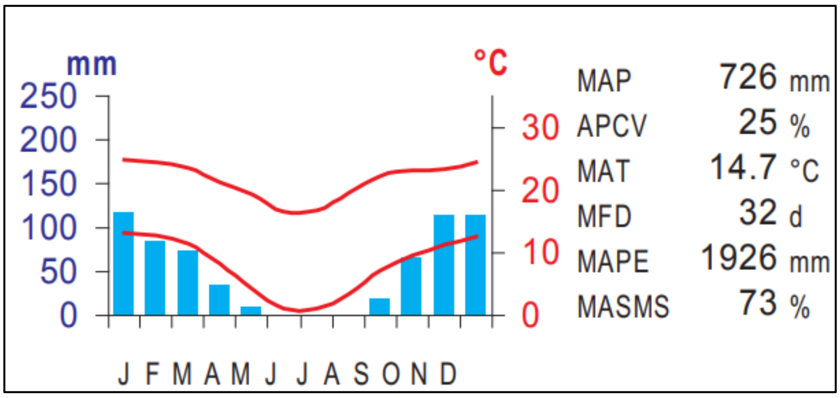


*Figure 8-1: The climate summary for local area.*

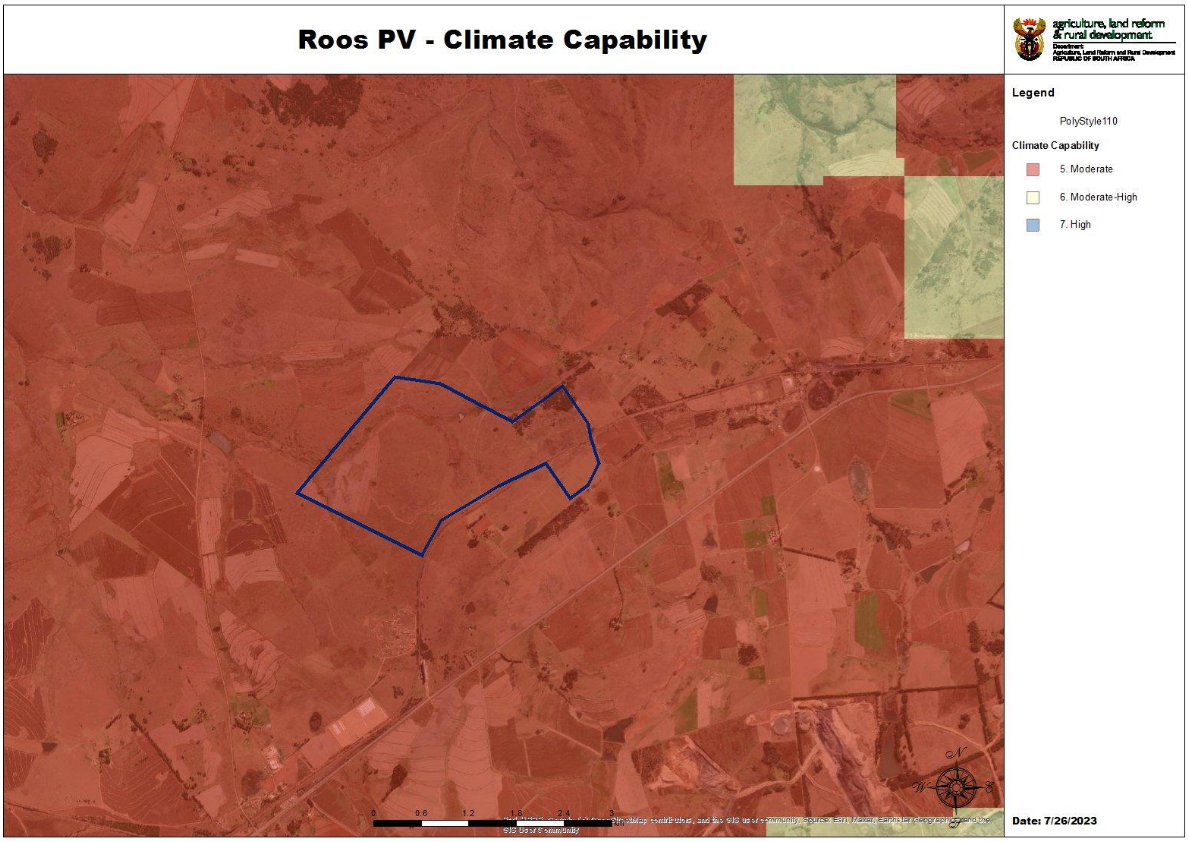


*Figure 8-2: The climate capability for the Roos PV project area.*

## 8.2 Terrain

The terrain analysis was conducted using the processing tools within the ArcGIS mapping software. The spatial analyst terrain analysis tools were used to determine the Digital Elevation Model (DEM) (see Figure 8-3). The project area is located in the crest and midslope regions of the catchment and drains to the north-west.

The Roos project has slopes that are generally flat in the eastern and southern portions of the project area, with slopes ranging from 0% to 12%, The remaining areas were steeper than 12% in slope (see Figure 8-4).

In land capability modelling terrain plays an important role not only from a plants' physiological growth requirements but also from a sensitivity and accessibility perspective (Department of Agriculture, Forestry and Fisheries, 2017). Two main terrain modelling concerns were included in the terrain capability modelling exercise namely:

- Plant physiology; and
- Terrain sensitivity

The terrain capability for the Roos project area was dominated by low ratings (see Figure 8-5).

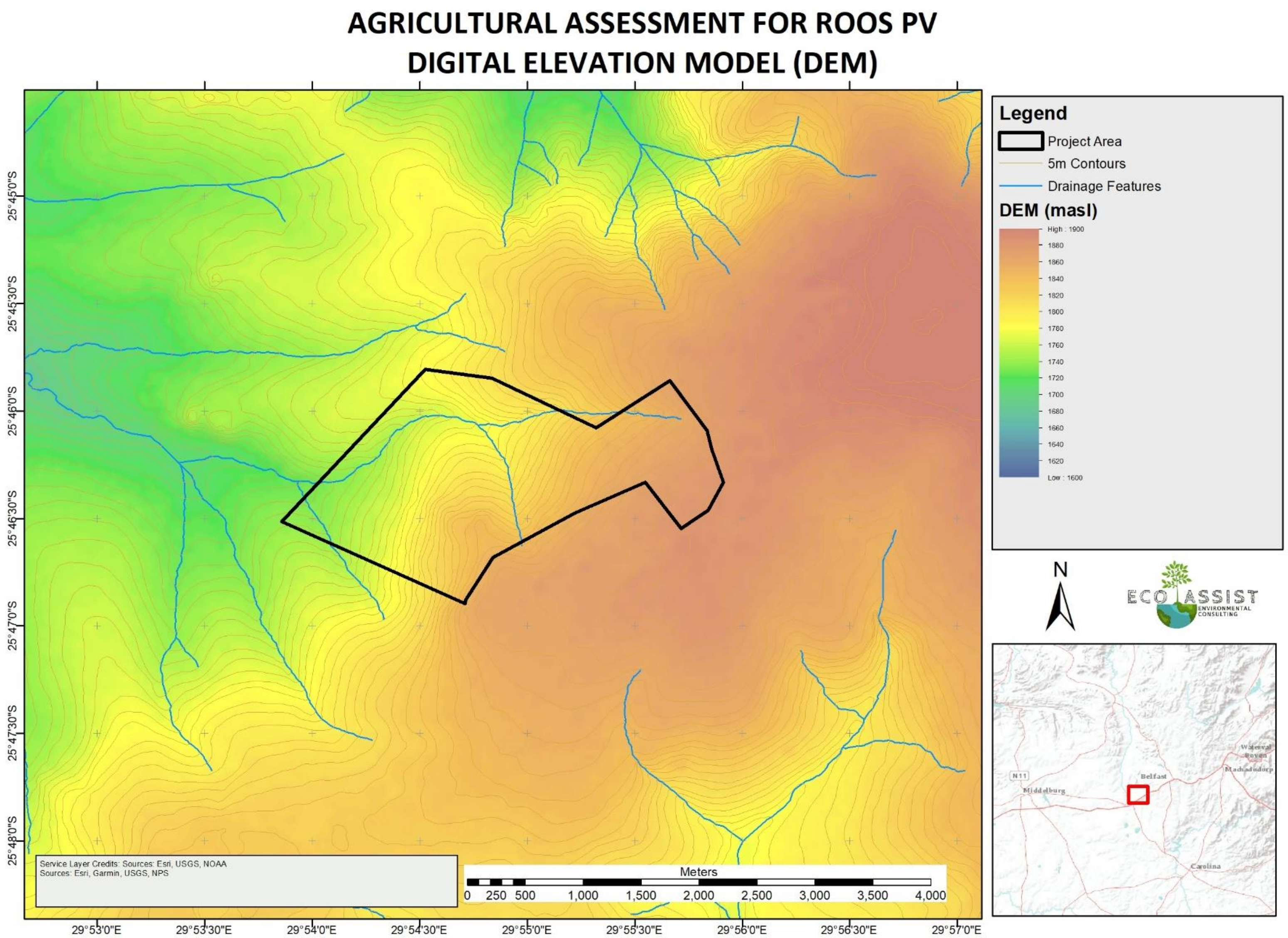


*Figure 8-3: The DEM for the Roos PV project area.*

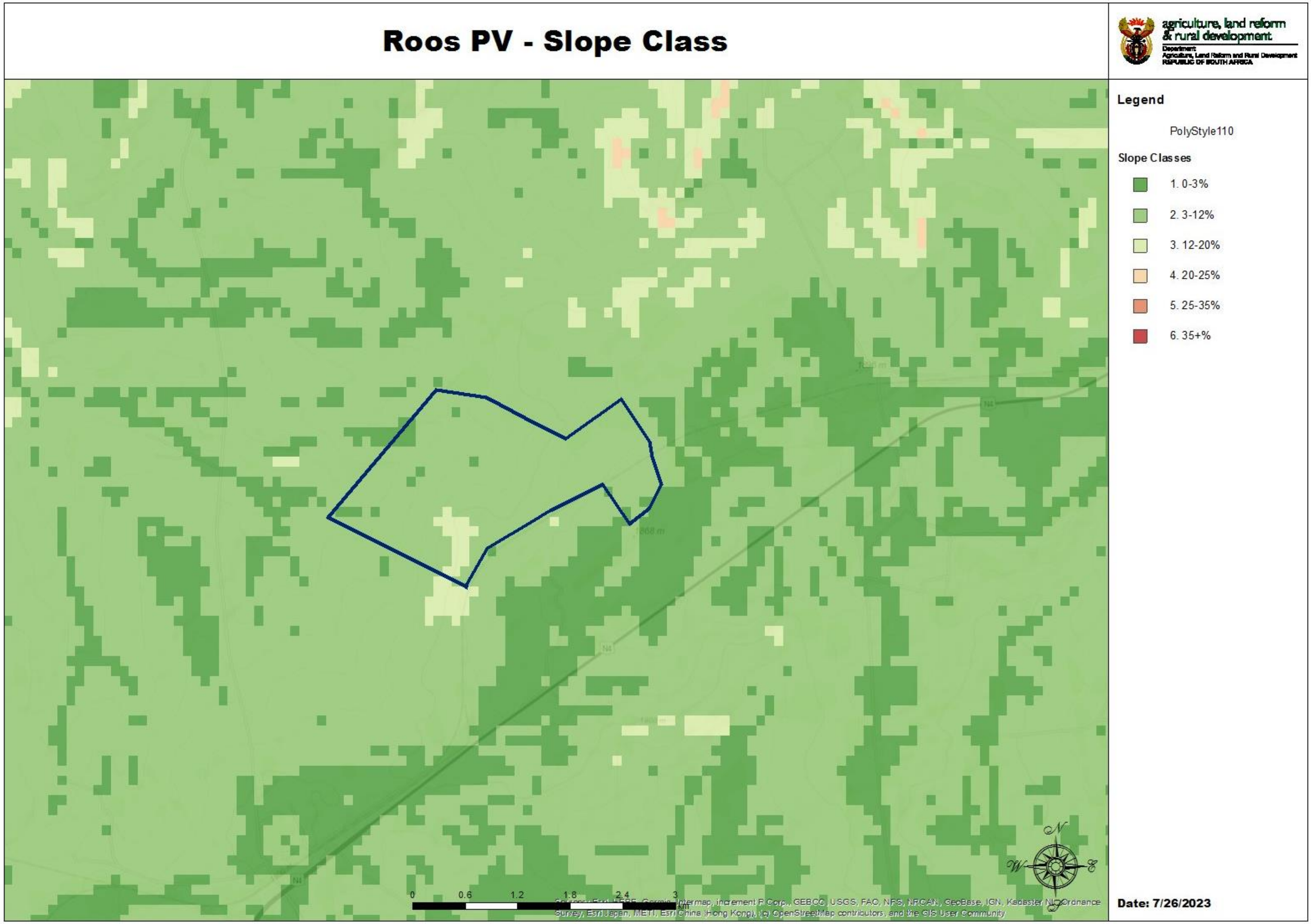


*Figure 8-4: The slope analysis for the Roos project area.*

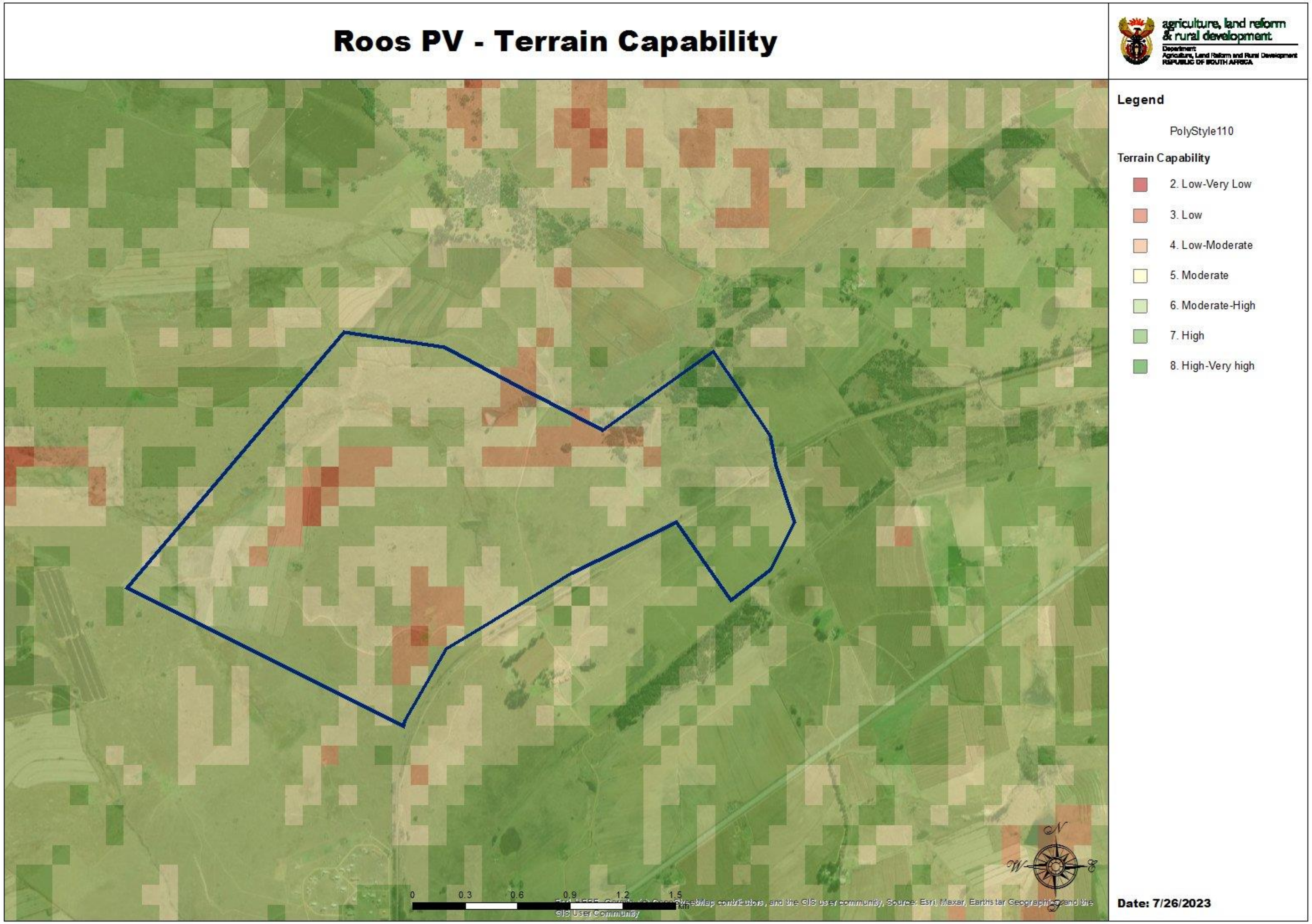


*Figure 8-5: The terrain capability for the Roos Solar PV area (Department of Agriculture, Forestry and Fisheries, 2017).*

## 8.3 Desktop Soils & Geology

### 8.3.1 Geology

The geology according to the landtype data for the project area is mainly quartzite and shale of the Steenkampsberg Formation; quartzite and shale of the Houtenbek Formation (Pretoria Group); gabbro, norite and anorthosite of the Main zone, Bushveld Complex. Smaller portions on the southern boundary also consist of shale, sandstone and grit of the Ecca Group, Karoo Sequence. The northern edge consists of Ferrogabbro, ferrodiorite and diorite of the Upper zone; gabbro, norite and anorthosite of the Main zone, Bushveld Complex; hornblende microgranite and piroxeenhornfels (Land Type Survey Staff, 1972 - 2006).

### 8.3.2 Land Types

The Land Type data was used to obtain generalised soil patterns and terrain types for the site. Land Type data exists in the form of published 1:250 000 maps. These maps indicate delineated areas of similar terrain types, pedosystems (uniform terrain and soil pattern) and climate (Land Type Survey Staff, 1972 - 2006).

The Roos project area falls within land types Ib34, Ad1, and Ea8 (see Figure 8-10). The Ib34 landtype is dominated by the crest and midslope landscape positions and consists largely of Glenrosa and Hutton soil forms (see Figure 8-6). The average slope for this land type is steep with slopes ranging from 12% to 100%. Clay content is estimated at between 15% and 40%.

The Ad1 landtype is dominated by the crest and midslope landscape positions and consists largely of the Clovelly and Glenrosa soil forms (see Figure 8-7). The average slope for this land type ranges from 0% to 8%. Clay content is estimated at between 10% and 40%.

The Ea8 landtype is dominated by the midslope and footslopes landscape positions and consists largely of Hutton, Shortlands, and Glenrosa soil forms (see Figure 8-8). The average slope for this land type steep with slopes ranging from 0% to 8%. Clay content is estimated at between 30% and 60%.

The average soil depth according to the landtype data for the project area is between 100mm and 600mm (see Figure 8-11).

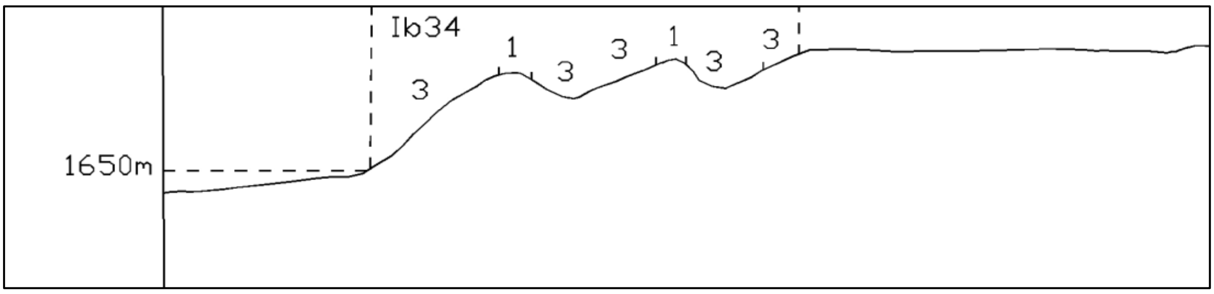


*Figure 8-6: Hillslope catena for land type Ib34.*

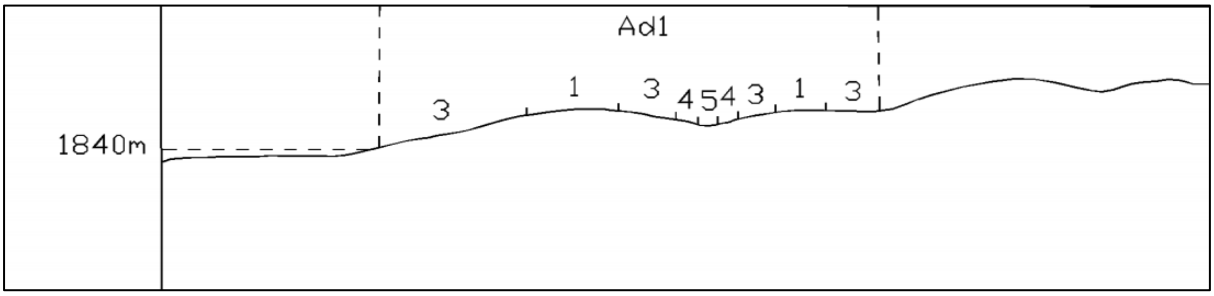


*Figure 8-7: Hillslope catena for land type Ad1.*

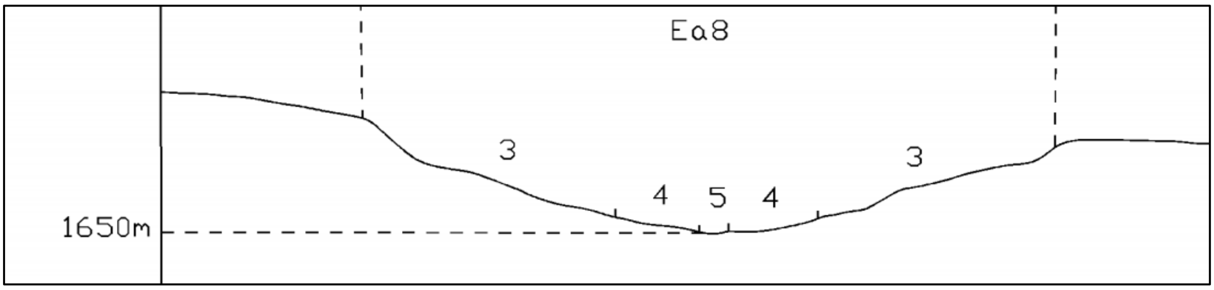


*Figure 8-8: Hillslope catena for land type Ea8.*

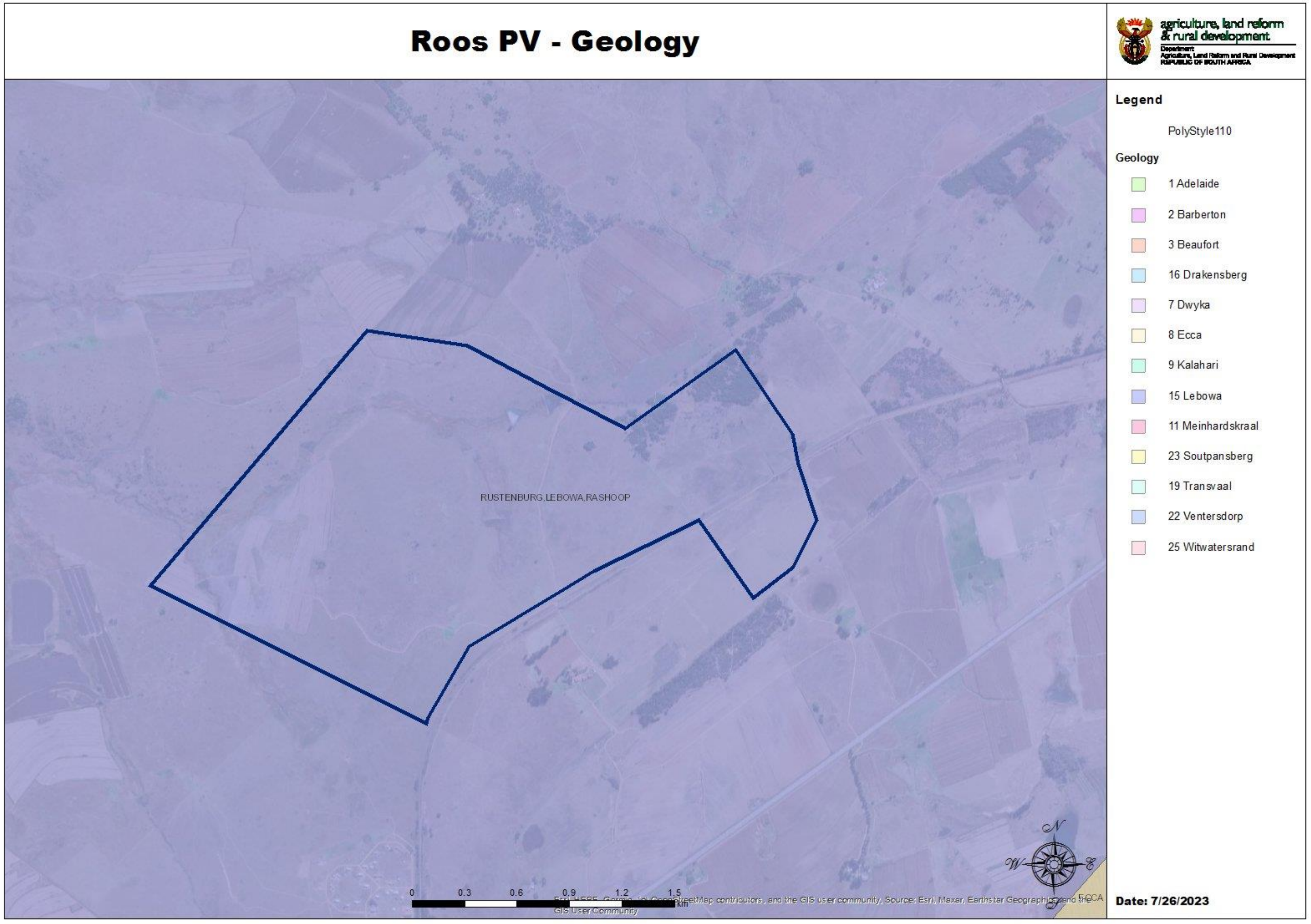


*Figure 8-9: Regional geology for the Roos PV project area.*

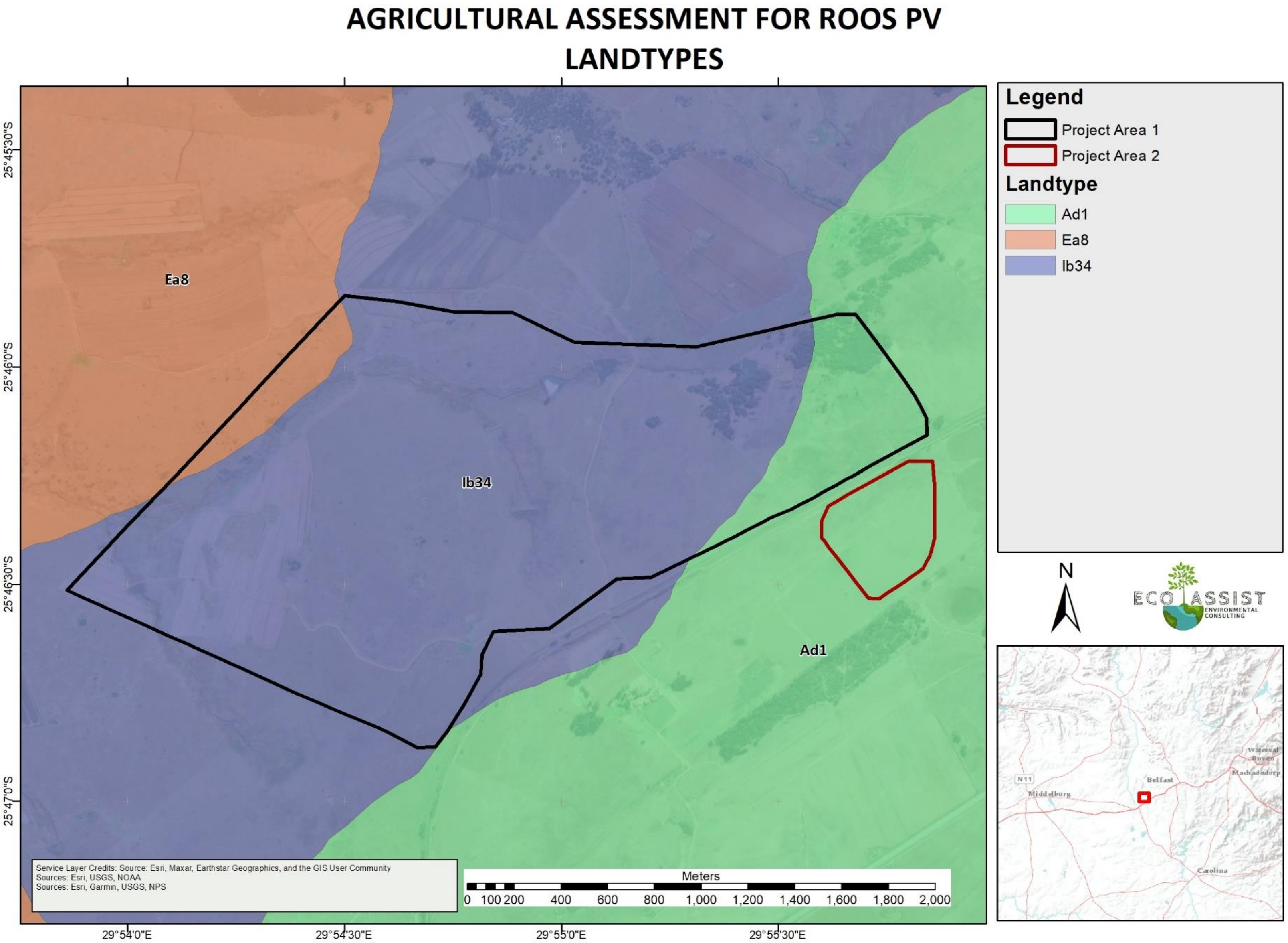


*Figure 8-10: Landtype within the Roos PV project area.*

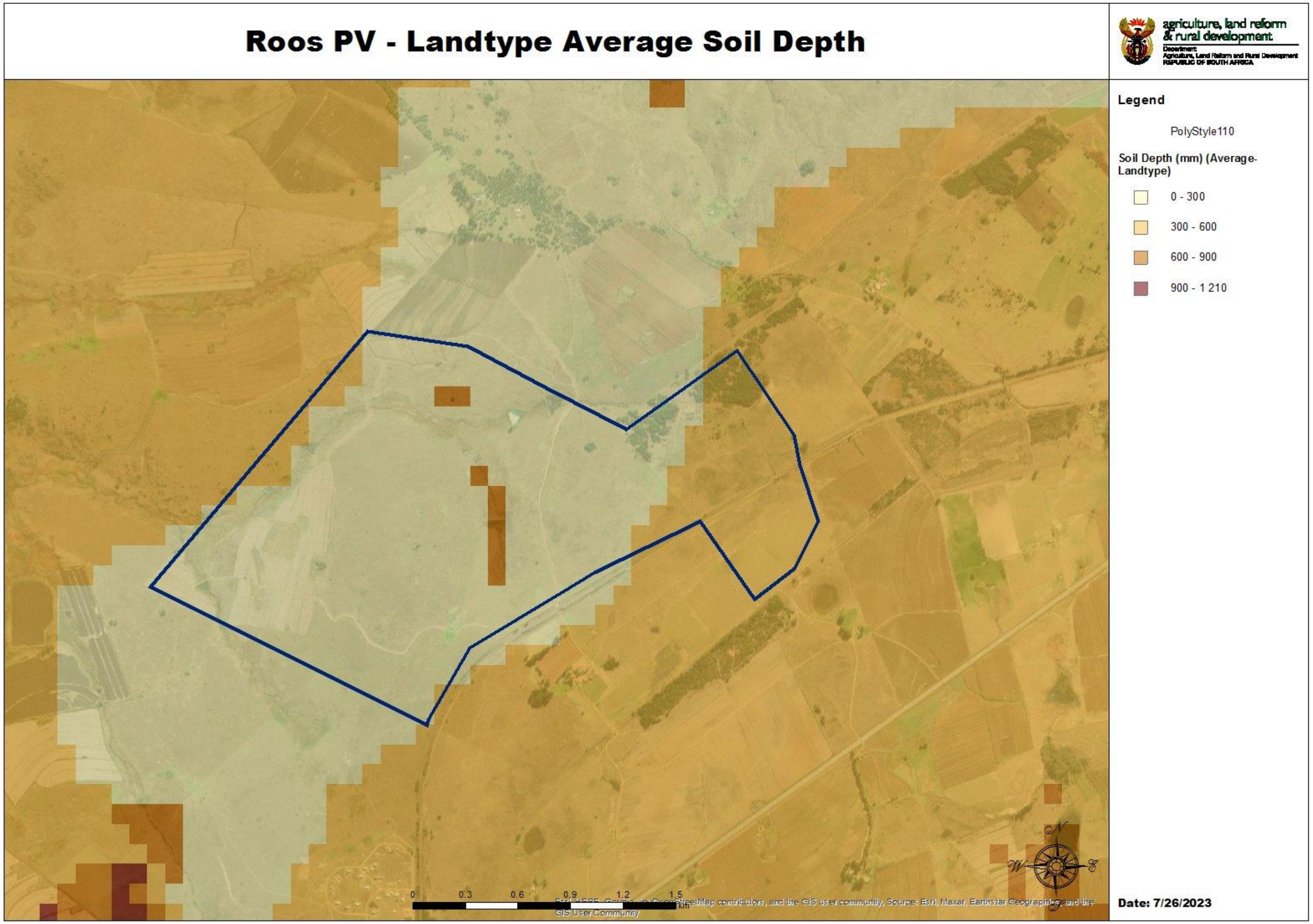


*Figure 8-11: Landtype soil depths within the Roos PV project area.*

#### 8.3.3 Soil Capability

Soil capability takes into consideration all aspects pertaining to the characteristics of the soil and their contributions towards plant production (Department of Agriculture, Forestry and Fisheries, 2017).

Three databases were used a part of the soil capability modelling:

- Land type data modelled and mapped into topographical units (Beukes). The data were modelled and rasterised form the original land type data base and the 90 m SRTM DEM. All the soil attributes are linked to fixed boundary zones. The soil concerns, issues and data are therefore aimed at an attribute rather than a spatial level;
- The land type soil attribute data base (ARC); and
- Soil fertility data (DAFF).

Three main modelling concerns formed part of the soil capability modelling:

- Plant available water;
- Soil sensitivity; and
- Soil fertility.

The soil capability for the overall project area ranged from Very-Low to Moderate-High. The area earmarked for the Solar PV was dominated by Very-Low with a small portion to the east being rated as Moderate. A very narrow edge of Moderate-High capability occurs on the northern edge of the project area (see Figure 8-5).

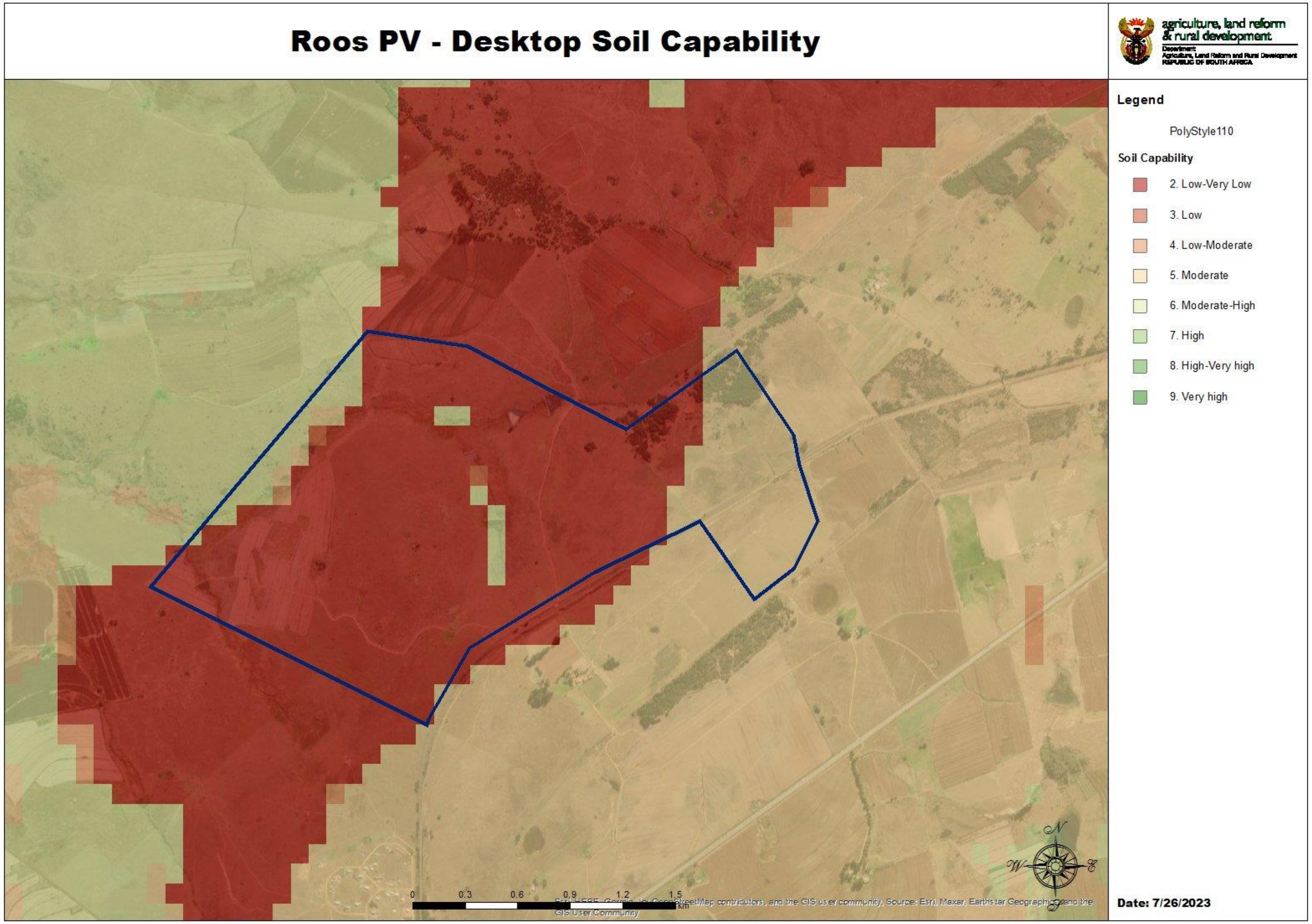


*Figure 8-12: Soil capabilities within the Roos PV project area (Department of Agriculture, Forestry and Fisheries, 2017).*

## 8.4 Land Capability

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.

To represent the distribution of the land capability evaluation values in the country, used as one of the input data layers to determine and demarcate all high value agricultural land for ensuring that these areas, pending availability, are preserved for continued agricultural production, thereby ensuring long-term national food security (Department of Agriculture, Forestry and Fisheries, 2017).

The data layer is a seamless data layer and does not exclude permanently transformed areas (built up; waterbodies; mining etc.).

The land capability for the overall project area ranged from Low-Very Low to Moderate-High. The area earmarked for the Solar PV was dominated by Low to Low-Moderate with a small portion to the east being rated as Moderate (see Figure 8-13).

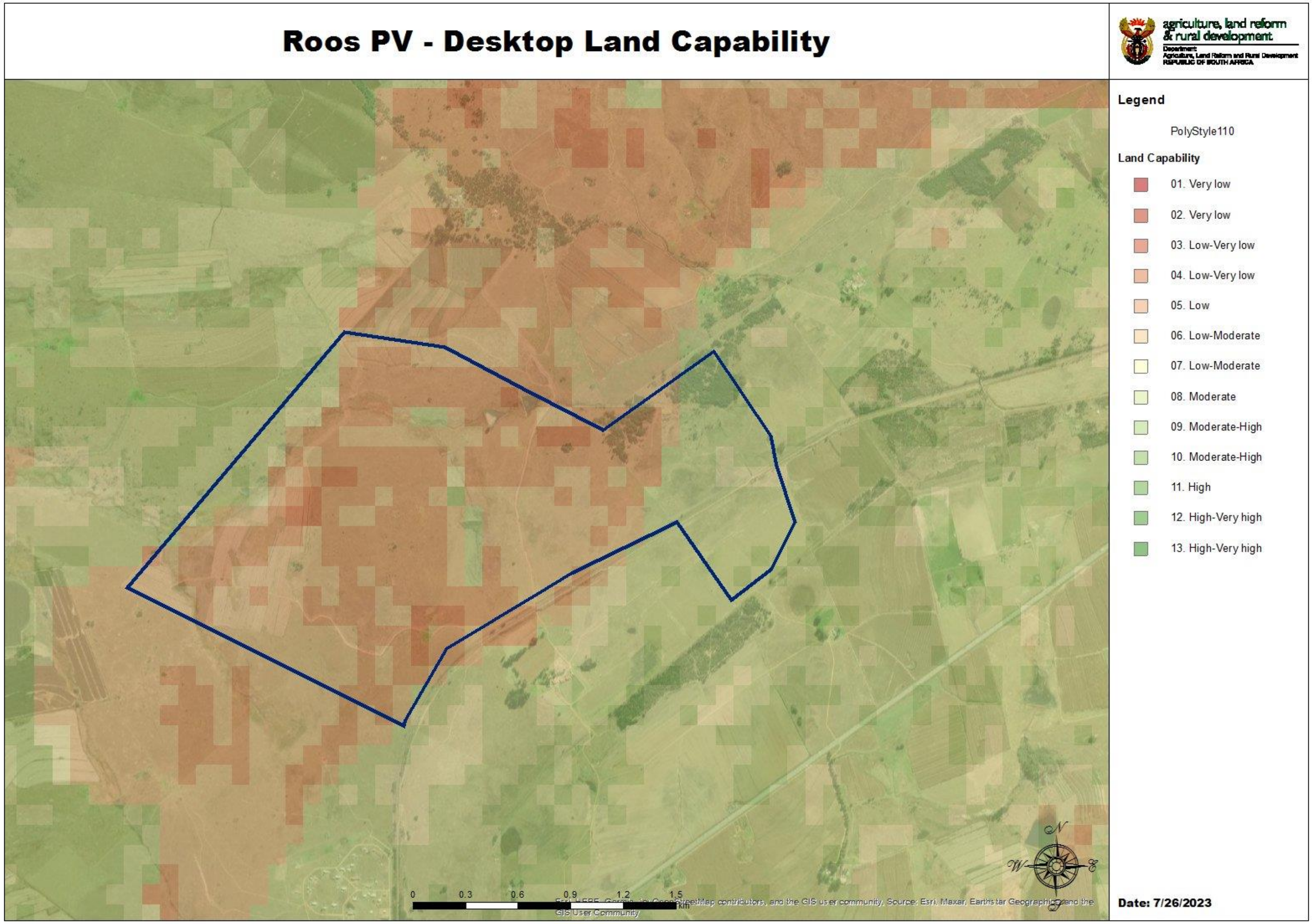


*Figure 8-13: Land capabilities within the Roos PV project area (Department of Agriculture, Forestry and Fisheries, 2017)*

## 8.5 Grazing Capacity

The long-term production potential of the herbaceous layer (grasses and forbs) of an area of vegetation that is required to maintain an animal with a weight of 450 kg (1 Large Stock Unit (LSU)) with an average fodder intake of 10 kg dry mass per day over a period that vegetation is suitable for grazing (mostly 1 year) without degrading the natural resources (vegetation and soil) and is measured in "Hectares per Large Stock Unit" (ha/LSU) (South Africa (Republic), 2018).

The long-term sustainable grazing capacity for the project area was 5ha per large stock unit (see Figure 8-14).

## 8.6 Cultivated Fields

The cultivated area maps (see Figure 8-15) shows that the project area only has very small portions being utilised for rainfed crop production in the western corner as well as a small section on the eastern edge.

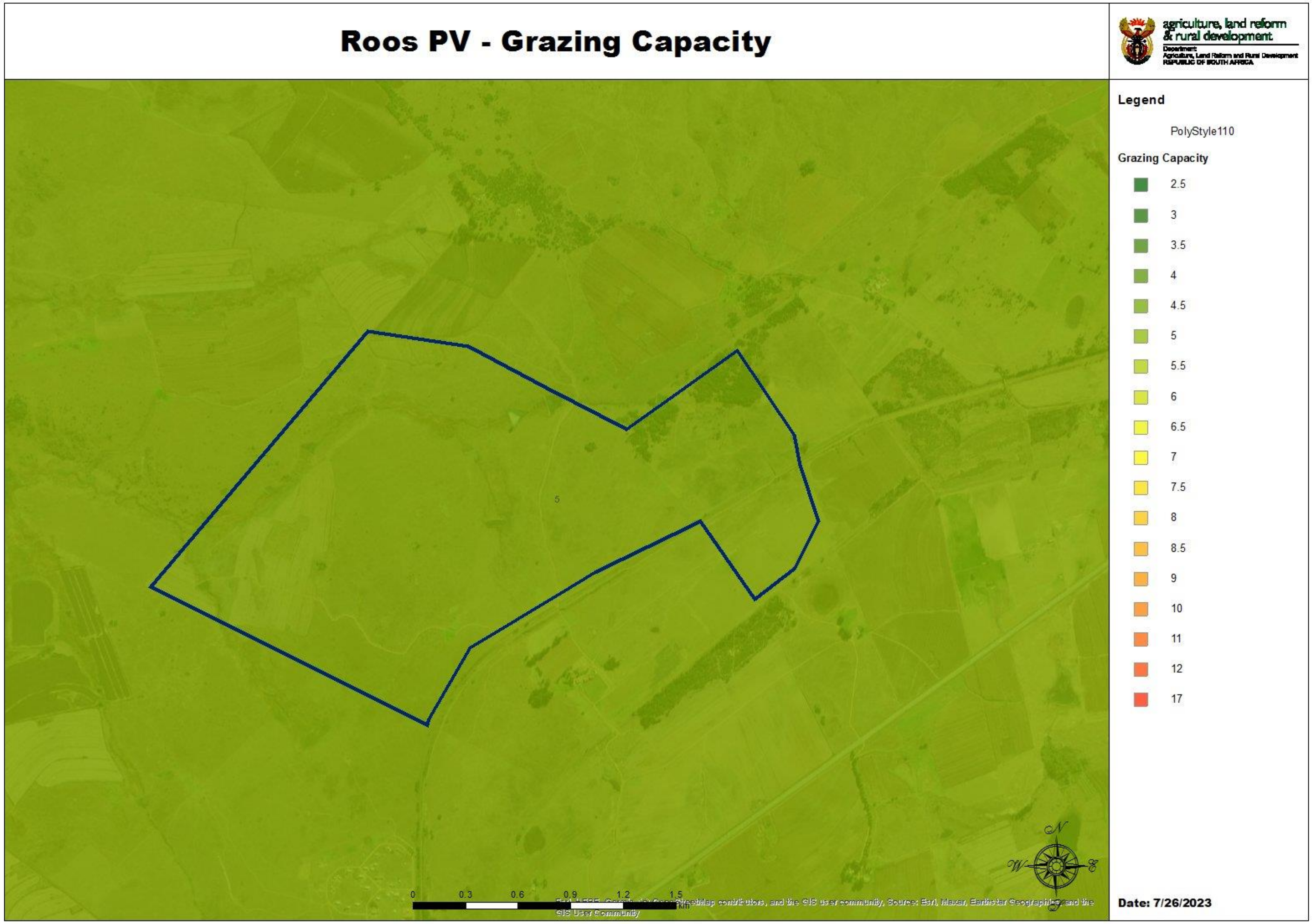


*Figure 8-14: The grazing capacity within the Roos PV project area (South Africa (Republic), 2018).*

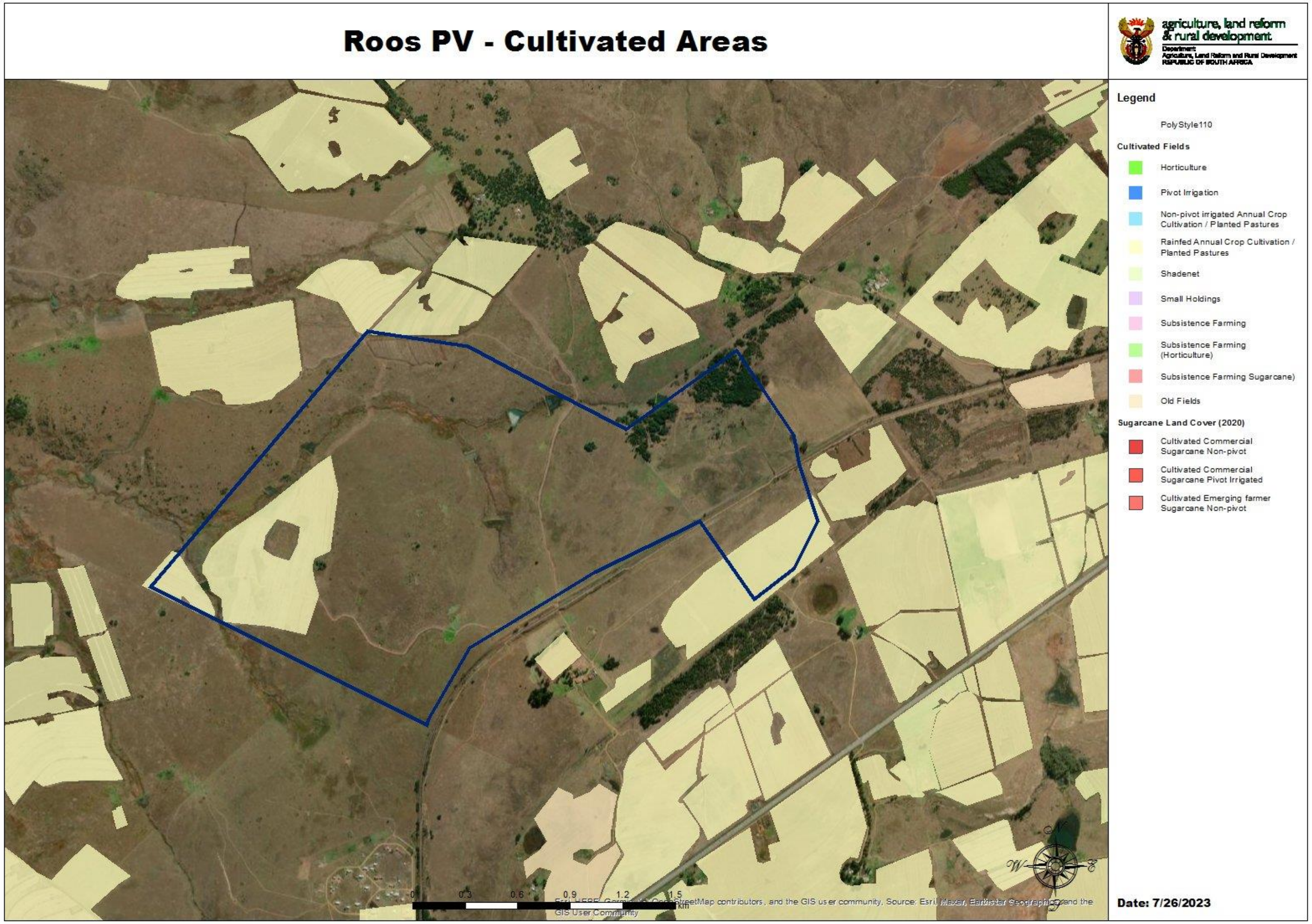


*Figure 8-15: The cultivated areas within the Roos PV project area (South Africa (Republic), 2018).*

# 9 SITE ASSESSMENT RESULTS

## 9.1 Field Verification Assessment

A site verification soil survey was conducted for the Roos PV project area in March 2023 using a hand-held auger and a GPS to log all information in the field. The soils were classified to the family level as per the "Soil Classification: A Natural and Anthropogenic System for South Africa" (Soil Classification Working Group, 2018).

During the field verification of the proposed project site, the specialist noted that the southern and eastern portions of the project area was fairly flat. The remaining area had moderate slopes. The only area being utilised for crop production was found in the western edge of the project area (see Figure 9-2) and the eastern edge had grassland that had been cut.

The project area was in general fairly shallow with rock outcrops visible at surface (see Figure 9-1). The shallow impermeable parent material has generated several soil profiles with Plinthic soil properties and some moisture at the soil-bedrock vadose zone interface (see Figure 9-3).

*Figure 9-1: Shallow Mispah soils.*

*Figure 9-2: Agricultural cropped area in the western corner of the project area.*

*Figure 9-3: Moisture within the shallow soil profile.*

The soil forms found are described in the subsequent sections and the extent of the soil delineation for the Roos project area is shown in Figure 9-4.

## 9.2 Soil Forms

The following soil forms were identified on-site for the Roos PV project area (see Table 9-1);

- Mispah (Orthic topsoil over hard rock);
- Dresden (Orthic topsoil over hard plinthic horizon);
- Glenrosa (Orthic topsoil over a lithic horizon);
- Tubatse (Orthic topsoil over a Neocutanic B-horizon overlaying a lithic horizon);
- Avalon (Orthic topsoil over a Yellow-brown apedal B-horizon overlaying a Soft Plinthic horizon);
- Westleigh (Orthic topsoil over a Soft Plinthic B-horizon overlaying a Gleyed horizon); and
- Katspruit (Orthic topsoil over a Gleyed horizon).

The project area was dominated by shallow to moderate depth soils ranging from 100mm to 600mm. The dominant soil form was the Glenrosa soil form, which is characterized by shallow soil depth on weathering rock. The soil profile often has large boulders within the soil profile. In addition to the Glenrosa soil form, shallow Mispah and Dresden soil forms were also identified. The soils with deeper profile depths were classified as the Tubatse (dry soil form) and the Avalon (plinthic soil form) soil forms. The footslopes and valley bottoms were dominated by the Westleigh and Katspruit soil forms.

*Table 9-1: Soil forms within the Roos PV project area.*

| Soil Form | Soil Family | Total Area of Soil Form (ha) |
|---|---|---|
| Glenrosa | 2120/2130 | 136.31 |
| Tubatse | 2122 | 56.70 |
| Mispah | 2120 | 13.38 |
| Dresden | 2000/3000 | 29.18 |
| Avalon | 2120 | 51.74 |
| Westleigh | 2200 | 72.89 |
| Katspruit | 1120 | 0.59 |
| Other (Dams & Infrastructure) | - | 3.62 |
| Total | | 364.41 |

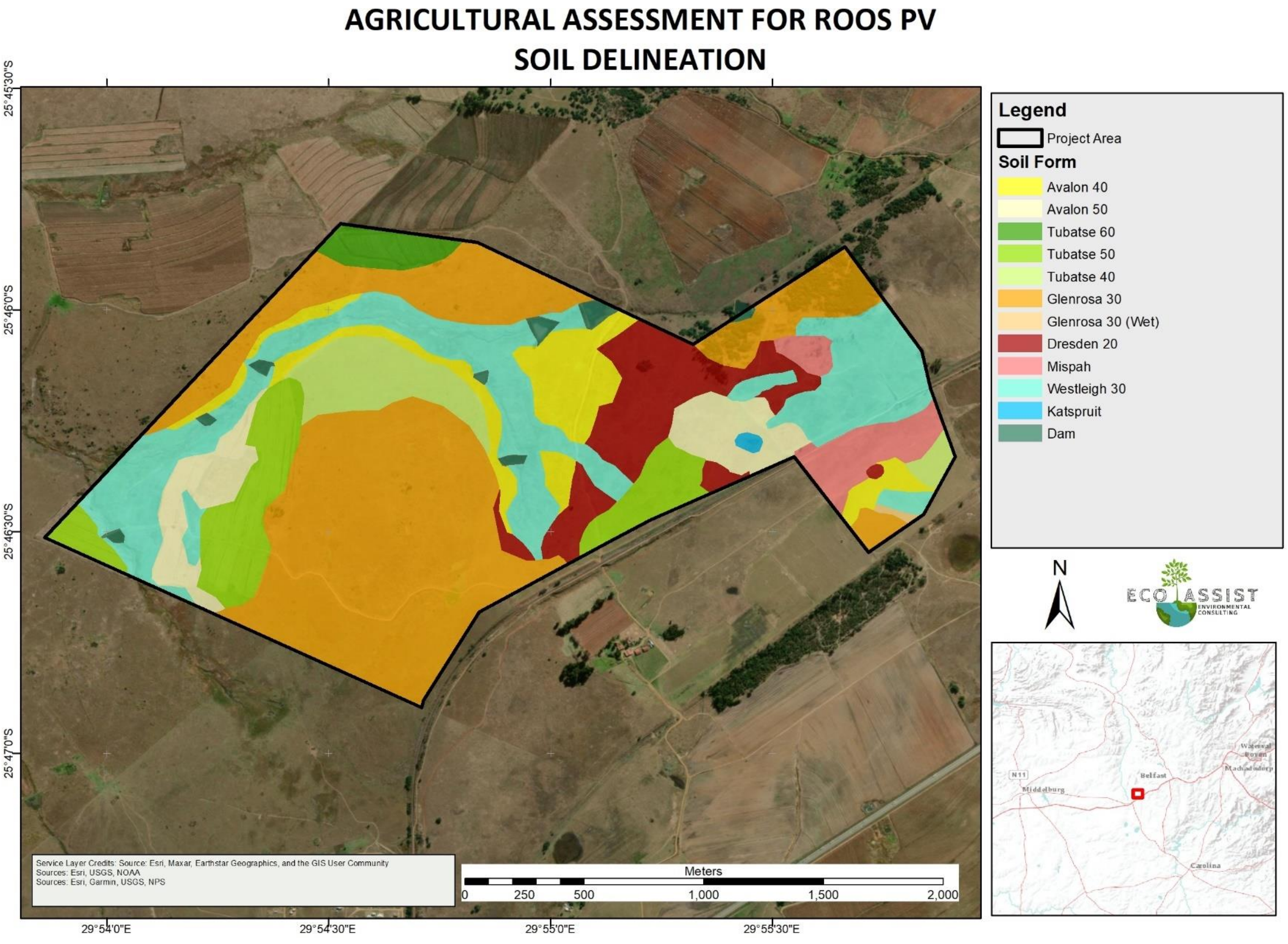


*Figure 9-4: The soil delineation for the Roos PV project area.*

## 9.3 Land Capability Classification

Agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions.

The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region.

**The land capability** is determined by using the guidelines described in “The farming handbook” (Smith, 2006). A breakdown of the land capability classes is shown in Table 5-2.

The land capability for the Roos project area is shown in Figure 9-5. The classification of the soil forms to the associated land capabilities is shown in Table 9-2.

The Glenrosa soil forms were split into class IV (light cultivation) and class VI (moderate grazing) land capabilities based on the soil depths, slopes and wetness indicators at each sample location. The Tubatse and Avalon soil forms were split into class III (moderate cultivation) and class IV (light cultivation) land capabilities. The Mispah and Dresden soil forms were both classified as class VI (moderate grazing) land capabilities. The Westleigh soil form had areas of sufficient wetness to be categorised as class V (wetland) along with the Katspruit soil form. The fringe areas of the Westleigh soil form with some depth prior to the wetness indicators were classified as class IV (light cultivation).

Class III and class IV are considered arable land, whilst class V and class VI is considered non-arable.

The data shows (see Table 9-3) that the dominant land capability for the Roos project area is the class IV land capability, which accounts for 225.6 ha (62%) of the total project area. The class III land capability is located in the western half of the project area and accounts for 40.82 ha (11%) of the project area.

*Table 9-2: Land capability per soil form within the Roos PV project area.*

| Soil Form | Land capability Class |
|---|---|
| Glenrosa | Class IV and Class VI |
| Tubatse | Class IV and Class III |
| Mispah | Class VI |
| Dresden | Class VI |
| Avalon | Class IV and Class III |
| Westleigh | Class IV and Class V |
| Katspruit | Class V |
| Other (Dams & Infrastructure) | Class V |

*Table 9-3: Land capability class area within the Roos PV project area.*

| Land capability Class | Total Area of Land Capability Class |
|---|---|
| Class III | 40.82 |
| Class IV | 225.6 |

| | |
|---|---|
| Class VI | 43.09 |
| Class V | 54.9 |
| Total | 364.41 |

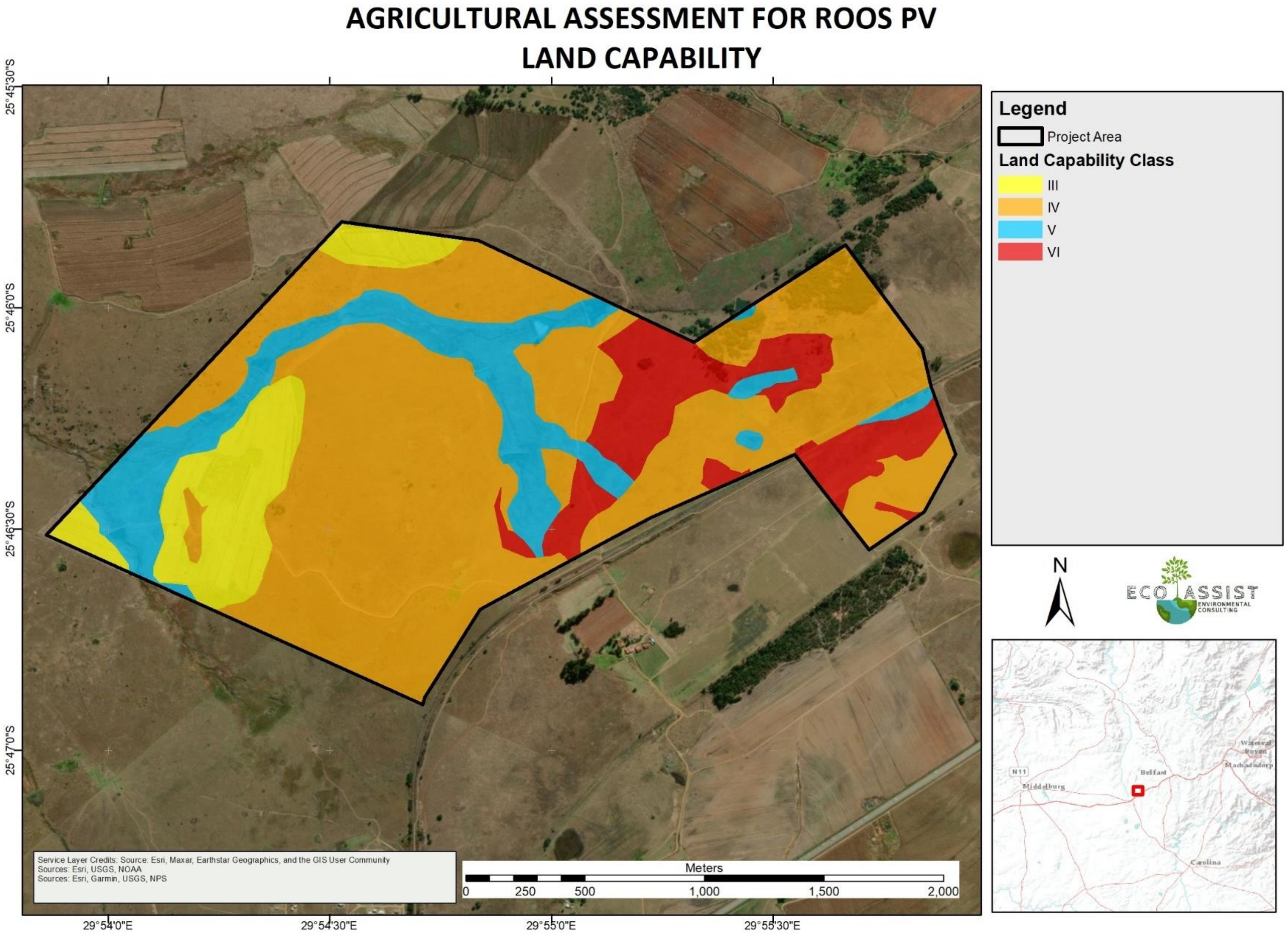


*Figure 9-5: The land capability for the Roos PV project area.*

## 9.4 Land Potential Classification

**The climate capability** for the project area is determined to be C2 – slight limitation rating (Smith, 2006). The local climate is favourable for a whole range of adapted crops and a year-round growing season. Moisture stress and lower temperatures increase risk and decrease yields.

**The Land potential / Agricultural potential** of the project areas are shown in Figure 9-6, with the breakdown of the areas is shown in Table 9-4.

The class VI land capabilities were classified as having land potentials of **L4 (moderate potential)** respectively, accounting for 43.09 ha. The class IV land capability was determined to be class **L3 (good potential),** accounting for 225.60 ha. The class III land capability was determined to be class **L2 (high potential),** accounting for 40.82 ha.

*Table 9-4: Land potential within the Roos PV project area.*

| Land Capability Class | Land Potential Class | Total Area of Soil Form (ha) |
|---|---|---|
| Class III | L2 | 40.82 |
| Class IV | L3 | 225.6 |
| Class VI | L4 | 43.09 |
| Class V | Vlei | 54.9 |
| Total | | 364.41 |

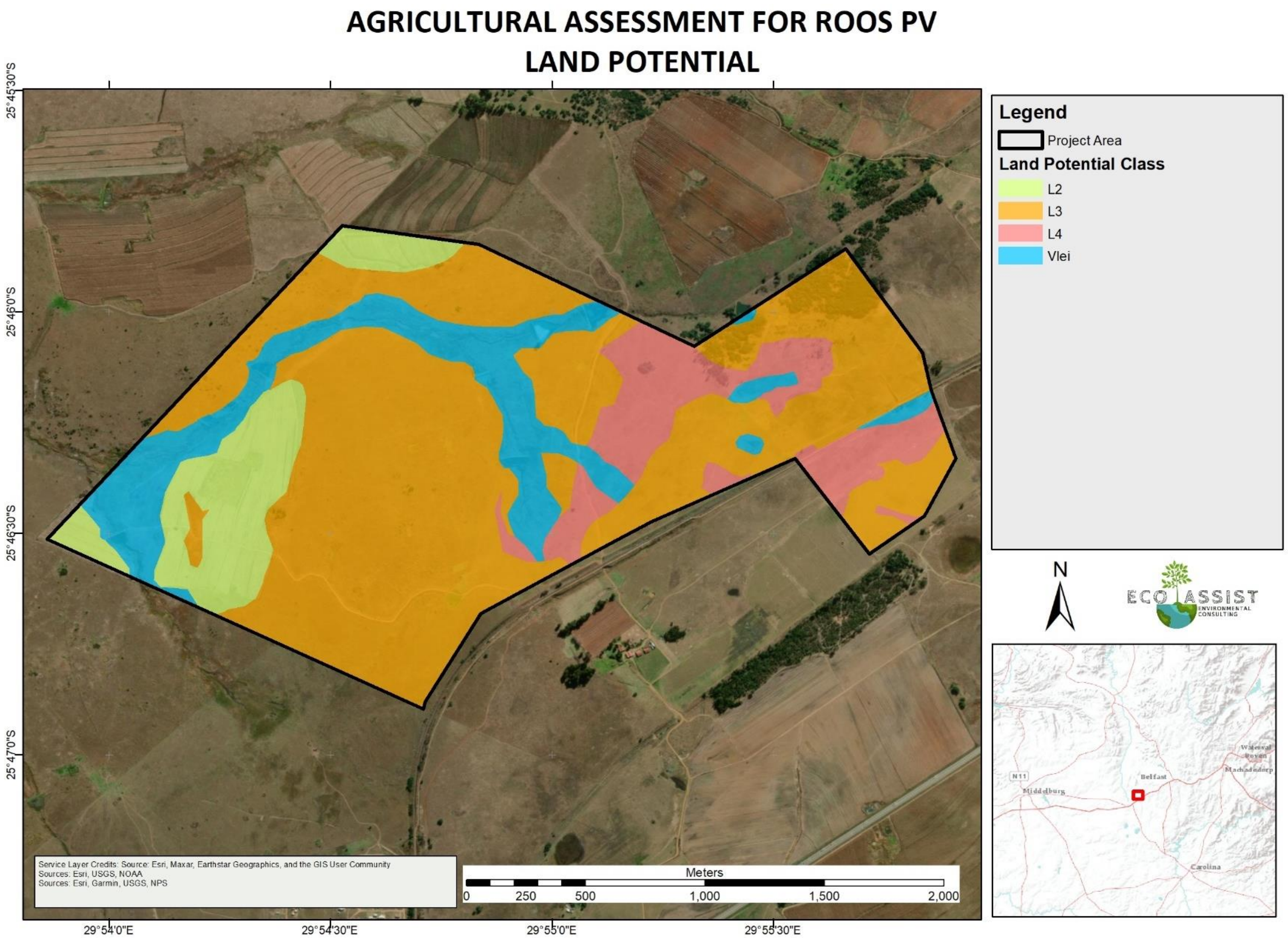


*Figure 9-6: The land potential for the Roos PV project area.*

## 9.5 Current Land Use and Land Cover

The South African National Landcover 2020 was used to show and identify the dominant landcover and land use in the project area (see Figure 9-7).

The project area is dominated by natural grassland and smaller areas of commercial annual cropping.

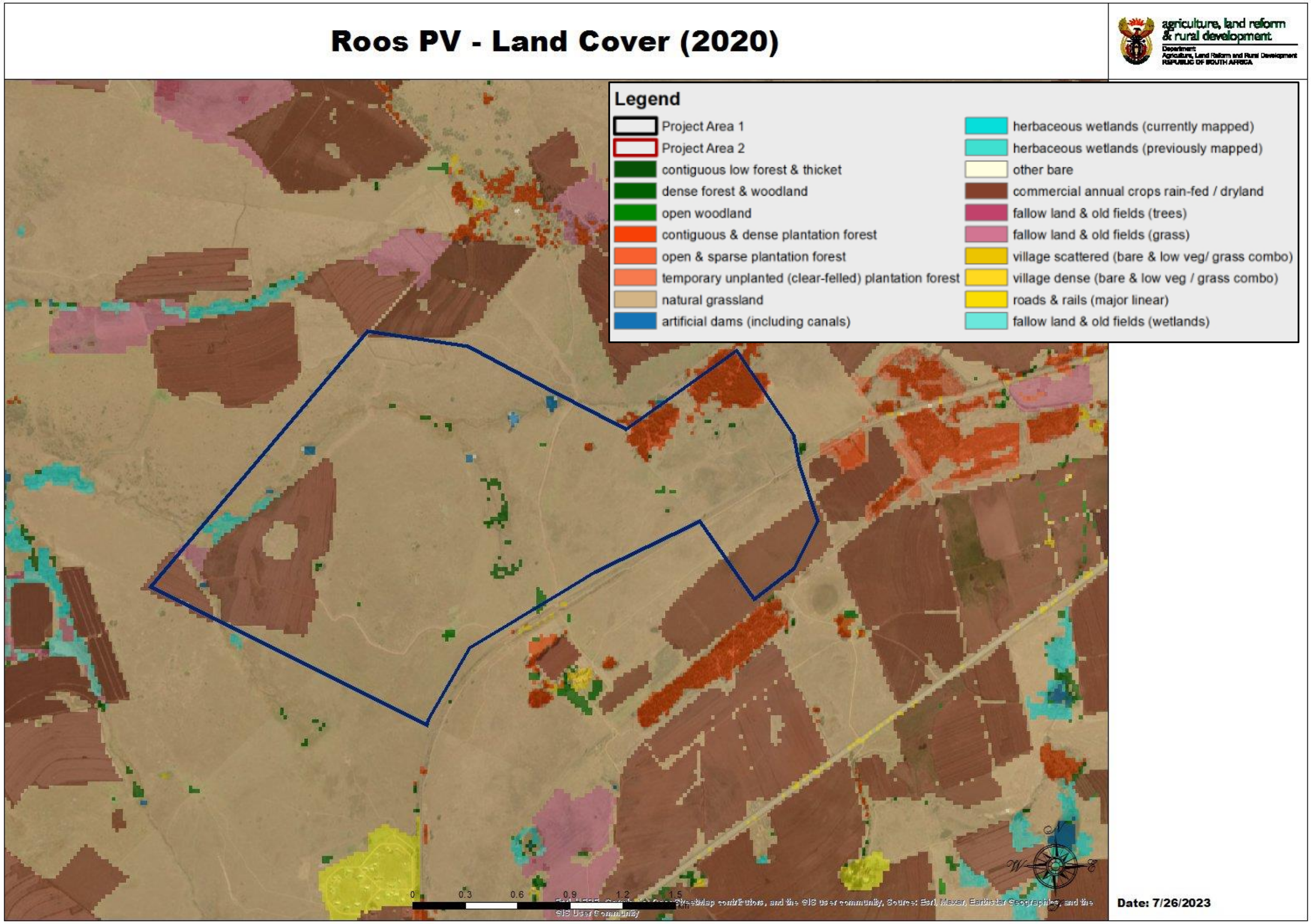


*Figure 9-7: The land cover and land use for the Roos PV project area.*

# 10 IMPACT ASSESSMENT

## 10.1 Impacts Identified

The potential impacts on agricultural resources identified for the proposed construction and operation of the proposed solar PV project are provided in Table 10-1.

*Table 10-1: Impacts description.*

| Impact | Description |
|---|---|
| Loss of agricultural land and Infrastructure. | Potential impacts include the removal of high value agricultural land and the associated infrastructure.<br>• High value agricultural infrastructure will be removed. The infrastructure such as farming equipment and farm buildings will be lost.<br>• The farming jobs provided will be lost.<br>• The Agricultural production and crops provided to the region will be lost. |
| Loss of agricultural land capability and potential / Loss of soil as a valuable and irreplaceable resource | Potential disturbances include compaction, physical removal, and potential pollution; The exposed soil surfaces have the potential to erode easily if left uncovered which could lead to the loss of the soil resource.<br>• Soils that are excavated will have their physical and chemical states altered negatively;<br>• Potential loss of stockpiled topsoil and other materials through erosion if not protected properly;<br>• Insufficient stormwater control measures may result in localised high levels of soil erosion, possibly creating dongas or gullies, which may lead to decreased water quality in surrounding watercourses;<br>• Increased erosion could result in increased sedimentation which could impact on ecological processes;<br>• The additional hardened surfaces created during construction could increase the amount of stormwater runoff, which has the potential to cause erosion;<br>• Physical disturbance of the soil and plant removal may result in soil erosion/loss; and<br>• Erosion and potential soil loss from cut and fill activities and areas where naturally dispersive soils occur. |

## 10.2 Cumulative Impact

The combined, incremental effects of human activity, referred to as cumulative impacts, pose a serious threat to the environment. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

The main principles for describing and assessment cumulative impacts are listed below (after DEAT, 2004):

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who has taken the action.
- It is not practical to analyse the cumulative effects of an action on every environmental receptor; the list of environmental effects must focus on those that are truly meaningful.
- Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative effects analysis on natural systems must use natural ecological boundaries.
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative effects may last for years beyond the life of the action that caused the effects.
- Each affected resource, ecosystem, and human community must be analysed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

The approach to assessing cumulative impacts is to screen potential interactions with other projects on the basis of:

- Past land capability impacts;
- Present land capability impacts; and
- Future land capability impacts/development pressure.

For the sake of this cumulative impact assessment, the study has taken into account all the above-mentioned components. Key considerations for the cumulative impact assessment are the current land uses and local anthropogenic activities, and the proposed operation. Findings from the cumulative impact assessment are presented in Table 10-3.

For a country to be regarded as food secure, the international norm of 0.4 ha per person is required for the production of food. In view of the current population figures in relation to the land currently under cultivation (inclusive of land under planted pastures, which do not directly contribute to food security), the norm in South Africa has dropped to below 0.25 ha per person per annum (Department of Agriculture, Land Reform and Rural Development, 2021). This already shows that the preservation of arable land is important.

According to the national soil capability evaluation data layer, more than 45% of the country's soils have a low to very low soil capability, 24% have a moderate soil capability and only ***11.4% have a high soil capability***.

34.1 ha of the project area is located on high value agricultural land (Category B) as per the KwaZulu-Natal Land Potential categories. These are explained in Table 10-2. However, only solar site PV 2 will encroach a small portion of this land capability.

Category B is high potential agricultural land. Due to the limited amount of Category B land in the province (and in the country), all efforts should be focussed on retaining land within this Category for predominantly agricultural use (Collett, A. and Mitchell, F. 2013).

*Table 10-2: KZN Land Potential categories (Collett, A. and Mitchell, F. 2013).*

| Category | |
|---|---|
| A | Very high potential agricultural land that should be retained exclusively for agricultural use so as to ensure national food security. Included within this Category is also identified grazing land that has a very high production value for sustained livestock production. |
| B | High potential agricultural land. Due to the limited amount of Category B land in the province (and in the country), all efforts should be focussed on retaining land within this Category for predominantly agricultural use. |
| C | Land with moderate agricultural potential, on which significant interventions would be required to achieve viable and sustainable food production, although agriculture is the still the majority land use in the rural landscape. |
| D | Land with low agricultural potential. This land requires significant interventions to enable sustainable agricultural production which could include terracing, contours, high levels of fertility correction, lower stocking rate, supplementary feed etc. Extensive areas of land are generally required for viable production (e.g., beef and game farming) although intensive production under controlled environmental conditions (e.g., green housing, poultry, piggeries) is not excluded, nor is intensive production on areas of arable land available e.g., along river systems. |
| E | Land with limited to very low potential for agricultural production. Cultivation within this land category is severely limited in both extent and in terms of the natural resources available, and grazing value will be poor with a very low carrying capacity. Land may have a high conservation or tourism status, depending on the locality, or may act as a buffer for as higher Category of adjacent land. In addition, these land parcels may be required to support the economic viability of an extensive grazing system on adjoining land parcels e.g., large dairy farming system. |
| Note | Also, important to recognise is that profitable agricultural intensification is often possible on land in category D or E, but will often require significant investment in soil conservation, soil fertility, supplementary feed or infrastructure. |

Soil quality deteriorates during stockpiling and replacement of these soil materials into soil profiles during rehabilitation cannot imitate pre-removal soil quality properties. Depth however can be imitated but the combined soil quality deterioration and resultant compaction by the machines used in rehabilitation, leads to a net loss of land capability. A change in land capability then forces a change in land use.

The impact on soil is Moderate because natural soil layers are stripped and stockpiled. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer. The topsoil layer is the layer where most plant roots are found and is predominantly 0.30m thick throughout the project area.

Once soil resources or agricultural land has been lost it is increasingly difficult to replace. Therefore, the impacts on a site specific and cumulative bases remain Moderate.

*Table 10-3: Cumulative Impact Assessment.*

| ACTIVITY: | CUMULATIVE IMPACT ASSESSMENT |
|---|---|

| | | |
|---|---|---|
| **Impact Description:** | Loss of soil as a natural resource, loss of land capability (food security), and Agricultural resources/infrastructure | |
| **Acceptable Rating Level** | No reduction of high potential agricultural land | |
| | **Before Mitigation (Site specific)** | **After Mitigation (Cumulative to the resource)** |
| **Magnitude** | The proposed operation will result in the direct loss of land capability through the construction and operation of the solar PV site 2.<br>**Major negative** | High potential agricultural land (Rare in South Africa) is under threat through. anthropogenic impacts (mining and development and this resource are linked to food security at a national level.<br>**Major negative** |
| **Duration** | The impact will be expected for the life of the project.<br>**Long Term** | The impact will be expected for the life of the project.<br>**Long Term** |
| **Extent** | Impacts to the resources are likely to be encountered locally. The loss of land capability is expected on a local level.<br>**Local** | Impacts to the resources are likely to be encountered locally. The loss of land capability is expected on a local level.<br>**Local** |
| **Probability** | The loss of land capability is highly likely as a result of the construction and operation of the solar PV site 2.<br>**Highly Likely** | The loss/reduction of land capability is highly likely as a result of the construction and operation of the solar PV site 2.<br>**Highly Likely** |
| **Significance of Impact** | **Moderate** | **Moderate** |
| **Degree of Confidence** | **High** | |
| **Mitigation:** | Taking into consideration the nature of the proposed project, resulting in the potential loss of<br>land capability, mitigation for the avoidance of these impacts is likely. | |

## 10.3 Impact Assessment Findings

From an agricultural perspective, the loss of high value farmland and / or food security production, as a result of the proposed activities, is the primary concern of this assessment. In South Africa there is a scarcity of high potential agricultural land, with less than 14% of the total area being suitable for dry land crop production (Smith, 2006).

Table 10-4 and Table 10-5 presents an overall summary of the significance of potential impacts before and after mitigation.

**Loss of soil as a resource and the loss of agricultural land capability/potential.**

During the construction phase, the areas infrastructure will be cleared of vegetation and topsoil. The impacts to consider are those relating to the disturbance of the natural soil state. When soil is stripped the physical properties are changed and this impacts on the soil's health. When the soil is stockpiled, the soils chemical properties will deteriorate unless properly managed. The stockpiles will cover soils, and these soils will become compacted and anaerobic conditions will come into effect. Altering the soil physical and chemical properties significantly.

These all potentially lead to the loss of the topsoil layer as a natural resource. Soil is considered a slow regenerating resource due to the fact that it takes several years for a soil profile to gain

10cm of additional soil through natural processes. A single rainfall event on unprotected bare soil area/stockpile could cause erosion and remove that same amount of soil if not more.

Whilst the construction/operation takes place vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases runoff potential. The increased runoff potential then leads to increased erosion hazards.

During the construction/operational phases, if the topsoil and subsoil are stripped and stockpiled as one unit the topsoil's seed bank and natural fertility balance is diluted. This will affect the regrowth of vegetation on the stockpiles as well as the regrowth when they have been replaced during the rehabilitation process, therefore soils should be handled with care.

When the topsoil is removed from the infrastructure areas, the land potential is reduced from a Class L2 and Class L3 to not classifiable. The land use will change from arable land to solar infrastructure.

It is important to note that the impacts are high during the construction and operational phases, due to the fact the soil resource and land capability are lost. The mitigation required during these phases does not reduce the impact during the current phases. The mitigation is however very important to reducing the long-term impact by ensuring that during the rehabilitation phase, the impacts become less severe by rehabilitating the impacts.

The impacts were grouped as follows;

- All Solar PV sites were located outside of the L2 (High potential land) land potential areas within the impact zones. Only L3 (Good potential land) and L4 (Moderate potential land) land potential areas will be impacted.

**Loss of Agricultural Resources and Infrastructure.**

The loss of Agricultural Resources and Infrastructure is directly related to the current agricultural land use and the equipment utilised. The areas being farmed through maize and the areas under grassland, will be lost and the equipment utilised as well as farm infrastructure will be rendered un-used or removed and therefore lost.

*Table 10-4: Assessment of significance of potential construction and operational impacts on agricultural potential associated with the proposed Roos PV project (all PV sites and preferred substation) pre- and post-mitigation.*

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Soil as a Resource | Loss of topsoil as a resource – Contamination, Disturbance, Erosion, and Compaction | 2 | 3 | 2 | 3 | 4 | 3 | 42 | - | Medium | See Mitigation Measures | 2 | 3 | 1 | 3 | 2 | 3 | 33 | - | Medium |
| High Value Land Capability | Loss of Land Capability | 2 | 4 | 2 | 2 | 4 | 3 | 42 | - | Medium | See Mitigation Measures | 2 | 3 | 2 | 2 | 2 | 3 | 33 | - | Medium |
| Agricultural Resources | Loss of Agricultural Resources and Infrastructure | 2 | 4 | 2 | 1 | 2 | 2 | 22 | - | Low | See Mitigation Measures | 2 | 2 | 2 | 1 | 2 | 2 | 18 | - | Low |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Soil as a Resource | Loss of topsoil as a resource – Contamination, Disturbance, Erosion, and Compaction | 2 | 4 | 2 | 3 | 3 | 2 | 28 | - | Medium | See Mitigation Measures | 2 | 3 | 2 | 3 | 3 | 2 | 26 | - | Medium |
| High Value Land Capability | Loss of Land Capability | 2 | 4 | 2 | 2 | 4 | 2 | 28 | - | Medium | See Mitigation Measures | 3 | 3 | 2 | 2 | 3 | 2 | 26 | - | Medium |
| Agricultural Resources | Loss of Agricultural Resources and Infrastructure | 2 | 4 | 2 | 1 | 2 | 2 | 22 | - | Low | See Mitigation Measures | 2 | 2 | 2 | 1 | 2 | 2 | 18 | - | Low |

*Table 10-5: Assessment of significance of potential construction and operational impacts on agricultural potential associated with the proposed Roos PV project (Alternative substation) pre- and post-mitigation.*

| ENVIRONMENTAL PARAMETER | ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S | | E | P | R | L | D | I / M | TOTAL | STATUS (+ OR -) | S |
| **Construction Phase** | | | | | | | | | | | | | | | | | | | | |
| Soil as a Resource | Loss of topsoil as a resource – Contamination, Disturbance, Erosion, and Compaction | 2 | 4 | 2 | 3 | 4 | 4 | 60 | - | High | See Mitigation Measures | 2 | 3 | 1 | 3 | 2 | 3 | 33 | - | Medium |
| High Value Land Capability | Loss of Land Capability | 2 | 4 | 2 | 2 | 4 | 4 | 56 | - | High | See Mitigation Measures | 2 | 3 | 2 | 2 | 2 | 3 | 33 | - | Medium |
| Agricultural Resources | Loss of Agricultural Resources and Infrastructure | 2 | 4 | 2 | 1 | 2 | 3 | 33 | - | Medium | See Mitigation Measures | 2 | 2 | 2 | 1 | 2 | 2 | 18 | - | Low |
| **Operational Phase** | | | | | | | | | | | | | | | | | | | | |
| Soil as a Resource | Loss of topsoil as a resource – Contamination, Disturbance, Erosion, and Compaction | 2 | 4 | 2 | 3 | 3 | 2 | 28 | - | Medium | See Mitigation Measures | 2 | 3 | 2 | 3 | 3 | 2 | 26 | - | Medium |
| High Value Land Capability | Loss of Land Capability | 2 | 4 | 2 | 2 | 4 | 2 | 28 | - | Medium | See Mitigation Measures | 3 | 3 | 2 | 2 | 3 | 2 | 26 | - | Medium |
| Agricultural Resources | Loss of Agricultural Resources and Infrastructure | 2 | 4 | 2 | 1 | 2 | 2 | 22 | - | Low | See Mitigation Measures | 2 | 2 | 2 | 1 | 2 | 2 | 18 | - | Low |

## 10.4 Mitigation Measures

The mitigation hierarchy is regarded internationally as the best practice framework for environmental planning and managing environmental impacts. It is a set of prioritized, sequential steps that are applied to anticipate, avoid, and reduce the potential negative impacts of project activities on the natural environment. It involves a sequence of four key components: avoidance, minimization, remediation, and offset as illustrated in (Edwards, et al., 2018).

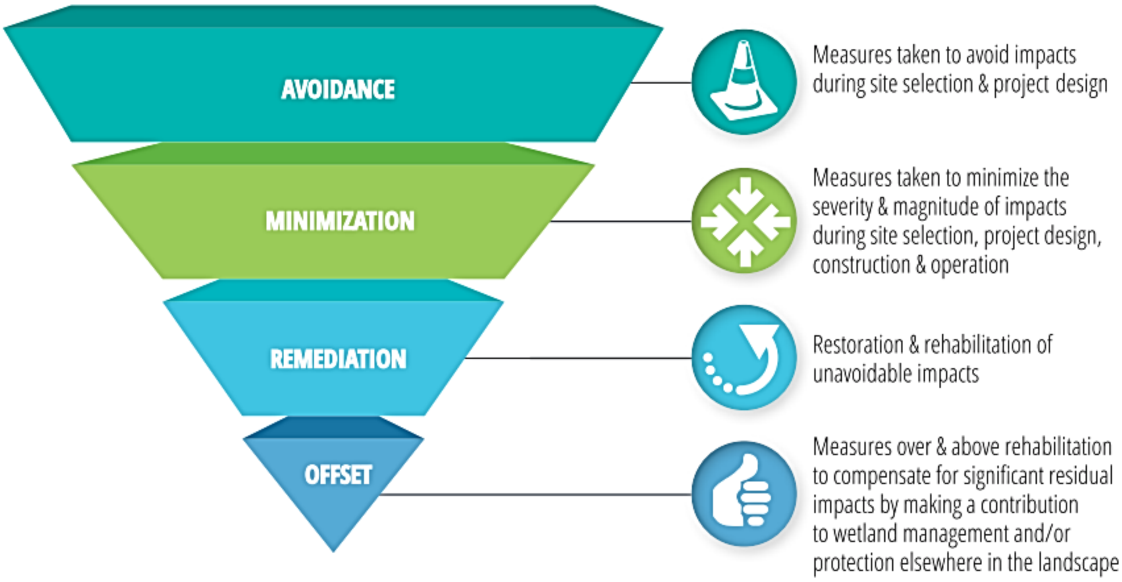


*Figure 10-1: The mitigation hierarchy (Edwards, et al., 2018)*

The focus of mitigation measures is to follow the mitigation hierarchy where possible. The prescribed mitigation measures for the proposed activity are provided in the respective sections below.

Based on the site layout only Solar PV site 2 falls with the L2 land potential. This area is small though and if the solar site can avoid these boundaries. The impacts will drop from a High to a Moderate impact.

Additionally, the preferred substation also falls within the L2 land potential. Therefor it is the specialist opinion that the alternative substation be selected.

*Table 10-6: Mitigation measures required for the proposed impacts on the agricultural resources for the Roos project.*

| Phase | Aspect | Impact Management Actions (Mitigation Measures) | Responsibility | Method | Impact Management Outcome | Timeframes/ Frequency |
|---|---|---|---|---|---|---|
| Planning<br>Construction<br>Operation | *Site clearance and topsoil removal prior to the commencement of physical construction activities.<br><br>*The construction of stockpiles | • Ensure proper storm water management designs are in place;<br>• If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;<br>• If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;<br>• Only the designated access routes are to be used to reduce any unnecessary compaction;<br>• Compacted areas are to be ripped to loosen the soil structure;<br>• The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks;<br>• Topsoil stockpiles are to be kept to a maximum height of 4m;<br>• Topsoil is to be stripped when the soil is dry, as to reduce compaction;<br>• Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter, and seed bank as possible (only after alien vegetation has been removed);<br>• The subsoil approximately 0.3 – 0.6 m thick will then be stripped and stockpiled separately;<br>• The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly;<br>• Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles;<br>• Topsoil stockpiles should only be used for the rehabilitation of the area;<br>• The stockpiles will be vegetated in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil. | • Applicant<br>• Contractor<br>• ECO | As prescribed by the Mitigation measures. | Prevent soil erosion and the loss of soil as a valuable resource | Ongoing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | • Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;<br>• If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities;<br>• All vehicles are to be serviced in a correctly bunded area or at an off-site location;<br>• Leaking vehicles will have drip trays place under them where the leak is occurring; | | | | |
| Operation and Rehabilitation. | • Operation and maintenance of the topsoil stockpiles.<br><br>• Rehabilitation of the Project area will be undertaken, which includes the ripping of the compacted soil surfaces, spreading of topsoil and establishment of vegetation. | • Ensure proper storm water management designs are in place;<br>• If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;<br>• If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;<br>• Only the designated access routes are to be used to reduce any unnecessary compaction;<br>• Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated;<br>• Implement land rehabilitation measures;<br>• Follow rehabilitation guidelines;<br>• The topsoil should be moved by means of an excavator bucket, and loaded onto dump trucks;<br>• Topsoil is to be moved when the soil is dry, as to reduce compaction;<br>• Topsoil to be replaced for rehabilitation purposes;<br>• The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; and<br>• Topsoil stockpiles should only be used for the rehabilitation of the area;<br>• Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;<br>• If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities;<br>• All vehicles are to be serviced in a correctly bunded area or at an off-site location; | • Applicant<br>• Contractor<br>• ECO | As prescribed by the Mitigation measures. | Prevent soil erosion and the loss of soil as a valuable resource | Ongoing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | • Leaking vehicles will have drip trays place under them where the leak is occurring; | | | | |
| Rehabilitation and monitoring | • Rehabilitation of the Project area will be undertaken. This includes the ripping of the compacted soil surfaces, spreading of topsoil and establishment of vegetation.<br><br>• Monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure that the project area is restored to an adequate state. Monitoring will include soil fertility and erosion. | • The rehabilitated area must be assessed once a year for compaction, fertility, and erosion;<br>• The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) as to correct any nutrient deficiencies;<br>• Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated;<br>• If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;<br>• If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;<br>• Only the designated access routes are to be used to reduce any unnecessary compaction; and<br>• Areas of subsidence must be reported and remediated as soon as possible with the best practises at the time of occurrence. | • Applicant<br>• Soil Specialist<br>• ECO | As prescribed by the Mitigation measures. | Prevent soil erosion and the loss of soil as a valuable resource | During monitoring |

# 11 ACTION MANAGEMENT PLAN

*Table 11-1: Action Management Plan.*

| Action plan | | | | |
|---|---|---|---|---|
| **Phase** | **Management action** | **Timeframe for implementation** | **Responsible party for implementation** | **Responsible party for monitoring/audit/review** |
| Construction | Bush clearing of all indigenous bushes and trees taller than one meter | This activity should be finished at least a week prior to any stripping of topsoil. | Applicant<br>Contractor | Applicant<br>ECO<br>Environmental authority |
| | Assign all access routes so that only designated routes are used to minimise additional impact areas. | This activity should be finished at least two weeks prior to commencement of any construction activities. | Applicant<br>ECO | Applicant<br>ECO<br>Environmental authority |
| | Stripping of topsoil | During the first month | Applicant<br>ECO<br>Contractor | Applicant<br>ECO<br>Environmental authority |
| | Stockpile the stripped soils in designated stockpile areas | During and after the soil stripping process. | Applicant<br>ECO<br>Contractor | Applicant<br>ECO<br>Environmental authority |
| | Vegetate these stockpiles | During and after the completion of the stockpiles. | Applicant<br>Contractor | Applicant<br>ECO<br>Environmental authority |
| Operation | Continuously monitor erosion on site | During the timeframe assigned for the project operation. | Applicant | ECO<br>Environmental authority |
| | Monitor compaction on site | During the timeframe assigned for the project operation. | Applicant | ECO<br>Environmental authority |
| | After the completion of the project the area is to be cleared of all infrastructure; | Within the first two months after the completion of the project. | Applicant<br>ECO<br>Contractor | ECO<br>Environmental authority |
| | Topsoil to be replaced for rehabilitation purposes; | After the completion of the foundation removal. | Applicant<br>ECO<br>Contractor | ECO<br>Environmental authority |
| Rehabilitation | All rehabilitated areas should be assessed for signs of compaction, fertility, and erosion. | Within the first month after the successful decommissioning of the<br>area. | Applicant | ECO<br>Environmental authority |

| | | | | |
|---|---|---|---|---|
| | The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) as to correct any nutrient deficiencies; | Within the first month after successful rehabilitation as well as yearly for the next 5 years to ensure that a sustainable soil resource is established. | Applicant | ECO<br>Environmental authority |
| | Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; | Monitoring compaction should take place every six months. In cases where compaction is identified, ripping should take place within the next month after detection. | Applicant | ECO<br>Environmental authority |
| | If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; | Monitoring erosion should take place every six months whilst monitoring for compaction. In cases where erosion is identified, relevant mitigation measures should take place within the next month after detection. | Applicant | ECO<br>Environmental authority |

# 12 AGRO-ECOSYSTEM ASSESSMENT FINDINGS

The sensitivity analysis has identified the project area to have a Medium to Low sensitivity, with small areas of High sensitivity where existing agricultural fields are. therefore, an Agro-ecosystem impact assessment is required.

The desktop results as well as the field verification and detailed soils assessment have determined that the agricultural potential is rated as Medium to High based on the climatic conditions as well as the soils identified on site. The following indicates the desktop and in field findings:

- Desktop Results;
- DEA screening assessment determined the agricultural sensitivity to be Medium to Low, with small areas of High;
- The project has small areas of crop field boundaries;
- The desktop land capability rated the project area as Low to Low-Moderate with a small portion to the east being rated as Moderate;
- The climate capability was determined to be Moderate;
- The desktop soil capability rated the project area as Very-Low with a small portion to the east being rated as Moderate. A very narrow edge of Moderate-High capability occurs on the northern edge of the project area; and
- The desktop grazing capability rated the project area as 5ha/LSU.
- Site Assessment Results;
- Land capability was determined as grazing to light cultivation;
- Land potential was determined to be L2 (high potential) to L4 (moderate potential); and
- Land use showed natural grasslands used for cattle grazing and small areas of maize farming.

# 13 ACCEPTABILITY STATEMENT

The specialist opinion is that the proposed project ***can be considered favourably*** from an agricultural and soils impact perspective based on the following;

- The DFFE screening tool showed very small areas of potential High sensitivity areas.
- These areas were isolated to the existing crop farming areas in the western edge of the project.
- The land capability is marginal with limited soil depth and a light cultivation to grazing capability only.
- Based on the site layout no Solar PV sites fall within the L2 land potential. The impacts are considered Moderate impact.
- Additionally, the alternative substation falls within the L2 land potential. Therefor it is the specialist opinion that the preferred substation be selected.
- The high potential land capability (L2; category B) must be retained for agricultural use due to the limited availability of high potential land, as per departmental guidelines.
- The only mitigation measure that will reduce the impact level is by avoiding the high potential (L2) areas completely.

# 14 REFERENCES

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