SOIL, LAND USE, AND LAND CAPABILITY (AGRICULTURE IMPACT) ASSESSMENT: FOR THE PROPOSED DEVELOPMENT OF RENEWSTABLE®QHAKAZA ON THE FARM SCHURVEPOORT 63-HS PORTION 10 IN AMERSFOORT WITHIN THE JURISDICTION OF DR PIXELY KA ISAKA SEME LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

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FINAL DRAFT

PREPARED FOR

HDF ENERGY
HYDROGEN POWER COMPANY

PREPARED BY

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DOCUMENT CONTROL

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Reference	Nsovo Environmental Consulting cc
Version	Final Draft
Submitted to	HDF ENERGY Pty Ltd
Author	Tshiamo Setsipane, (Pr. Sci. Nat)
Reviewer	Munyadziwa Rikhotso
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 plants based on hydrogen energy storage technology. They will provide the country with the respective electricity services. This ESIA is specifically for the proposed Renewstable®Qhakaza, within an agricultural area on the Farm Schurvepoort 63-HS Portion 10, located approximately 18 km northeast of Majuba Power Station and approximately 8 km southeast of Amersfoort, within Ward 7 of the Dr Pixley Ka Isaka Seme Local Municipality in the Mpumalanga Province. The extent of the site is approximately 120 ha. The proposed site is located approximately 10km south-west of Amersfoort and 10km north-east of Daggakraal in Ward 7 of Dr Pixley Ka Isaka Seme Local Municipality (DPKISLM), in turn, forms part of the Gert Sibande District Municipality (GSDM) of the Mpumalanga Province.

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.

Nsovo Environmental Consulting was appointed 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). This report is specifically for Renewstable Qhakaza within portion 10 of the farm Schurvepoort 63-HS (henceforth referred to as the study area).

Based on the observations during the site assessment, the dominant soils within the study area are Mispah/Glenrosa, Mispah/Grabouw and Katspruit (associated with the watercourse). 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 and make them more productive.

Table A below depicts 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® Qhakaza Study Area				
Soil Forms	Area (Ha)	Percentage (%)	Land Capability	Agricultural Potential
Glenrosa/Grabouw	72.30	52.2	Arable (Class IV)	Moderate
Katspruit	0.56	0.5	Watercourse (Class V)	Very Low
Mispah/Glenrosa	43.43	37.3	Grazing (Class VI)	Low
Total Enclosed	**116.29**	**100**		

The development footprint presents areas of active pasture utilised for grazing purposes and some grass 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, with the aim of minimising the potential loss of these valuable soils, considering the need for sustainable development.

Although the loss of agricultural soils and the permanent change in land use will be localised within the study area, the cumulative loss of agricultural resources locally and regionally is moderate without mitigation and low with mitigation measures. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of high-potential agricultural soils. Therefore, integrated mitigation measures must be implemented accordingly, with the aim of minimising the potential loss of these valuable soils, considering the need for sustainable development. Mixed land use, such as sheep grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy.

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 B below.

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

SITE SENSITIVITY VERIFICATION			
	Screening Tool		Site Verification Outcome
Renewstable Qhakaza 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.

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 (Pr. Sci. Nat)

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 in 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	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 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 3.2
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,	Section 1.6

	expressed as an annual figure and broken down into production units;	
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.).	Figures 20-23
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 6
2.5.2	change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure and	N/A
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 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;	Figures 12- 14
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;	Section 1.6

2.7.7	An indication of possible long-term benefits that will be generated by the project in relation to the benefits of the agricultural activities on the affected land;	Section 5
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 4.2
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
2.7.14	Any conditions to which this statement is subjected;	Section 5
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

The project's main objective is to design, develop, build, manufacture, operate, and maintain a 34MW Renewstable® Qhakaza power plant and related infrastructure near Amersfoort in Mpumalanga to generate clean energy/electricity, increase access to electricity and contribute to the country's sustainable development initiatives.

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.

The proposed project will be located outside an urban area, near Amersfoort on the Farm Schurvepoort 63-HS Portion 10, approximately 18 km northeast of Majuba Power Station and 8 km southeast of Amersfoort, within Ward 7 of DPKISLM in the jurisdiction of the Gert Sibande District Municipality, Mpumalanga Province. The site is approximately 117 ha. Figure 1 below is a locality map depicting the proposed study area at a scale of 1:50 000.

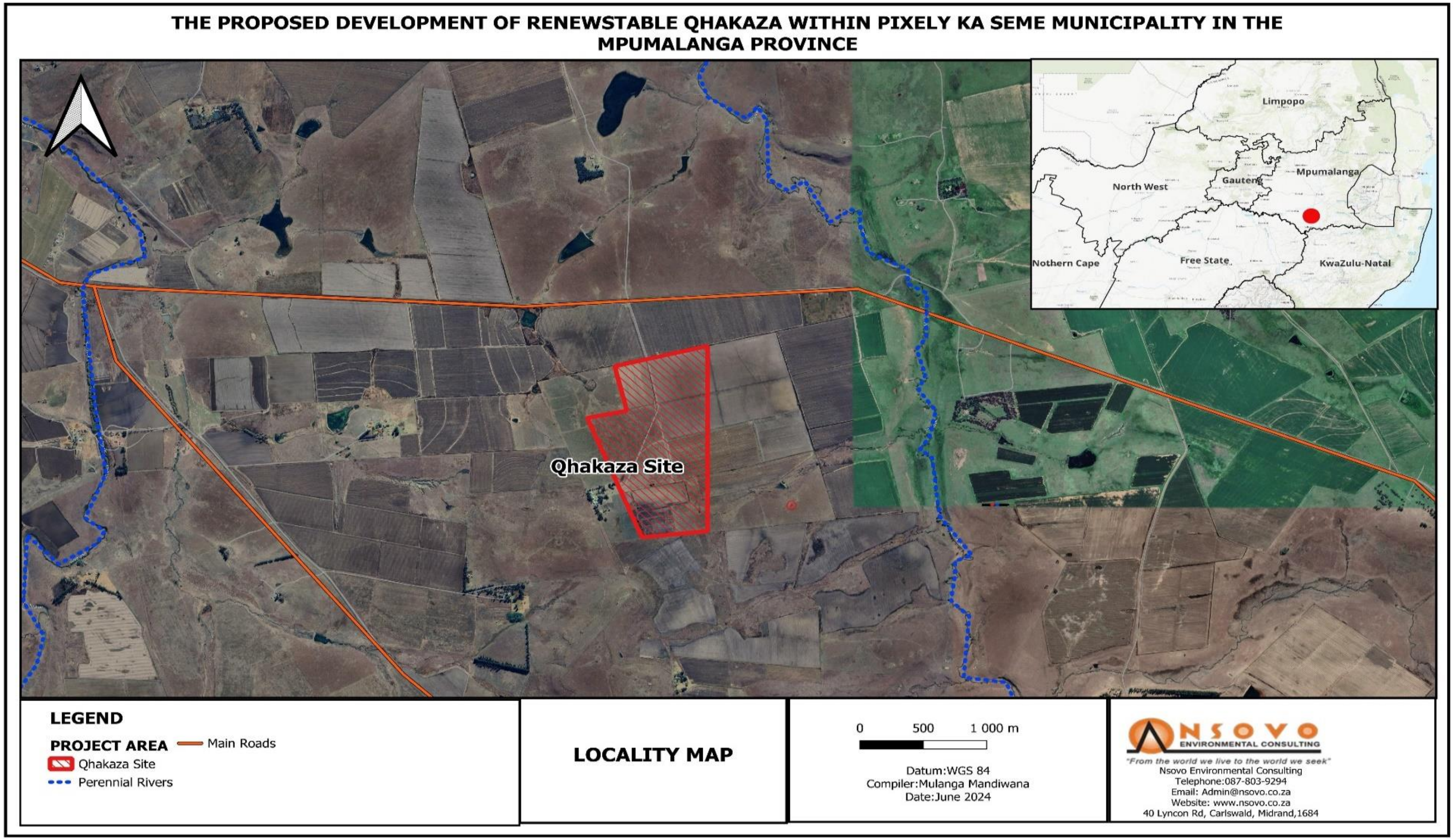

Figure 1: Locality of the study area in relation to the surrounding areas.

1.1 Project description

HDF-Energy proposes the development of a 34MW Renewstable®Qhakaza Power Plant, which is 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 plant 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 plant is scheduled to be commissioned in 2029 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:

Primary Infrastructure	Power Produces
Baseload electricity	25 MW morning, day, and evening - 6 MW night
Solar plant	80 MW
Electrolyzers	30 MW
Green H2 storage	132MWh
High-capacity fuel cells	6MW
Battery power	25MW
Battery storage	100MWh
Land required	110 hectares
Capacity factor	87%
Electricity production	356.16MWh daily 130 000 MWh yearly

Associated infrastructure includes the following:

- Hydrogen Power Centre
- Control Room
- Warehouse
- Access roads
- Communication DC and AC cables installed underground and overhead
- Fencing and security
- 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 fulfil 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, and vegetation, as well as 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 for the majority 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,
- A detailed investigation of economic aspects pertaining to the Production figures in terms of yield could not be sourced from the Natural Agricultural Resources Atlas of South Africa as the data was not available for areas utilising their land for pasture; and
- 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.

2. METHODOLOGY

The assessment of the Study Area's agricultural potential was based on a combination of desktop studies to gather general information, site visits for status quo assessment, soil classification and characterization, and validation of the information generated 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 and Sensitivity Verification

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 three days in October 2023 and over one day in May 2024, during which time 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.

The aim of the on-site Site Sensitivity Verification was to:

- Ground truth if there are any cultivation activities and consequent agricultural sensitivity;
- Gain an understanding of the agricultural potential of the study through the identified soils on site as well infrastructure; and
- Confirm or dispute the current land use and the environmental sensitivity as indicated by the National Environmental Screening Tool.

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 Scotney *et.al* (1987).

Table 1: Soil Capability Classification (after Scontey *et al.*, 1987).

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

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
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 producing 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 too low to the updated land capability ratings.

Table 2: National Land Capability Values (DAFF, 2017).

Land Capability evaluation value	Land Capability Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

Table 3: 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 limitingfactor 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 watererosion potentials.
Slope	The slope of the site could potentially limit the agricultural use thereof.
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 nottolerate submergence in water.
Mechanical Limitations	Mechanical limitations are any factors that could prevent the soil from beingtilled 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 couldinfluence 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 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 pertaining to 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.

Thus, the report is 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 2 below:

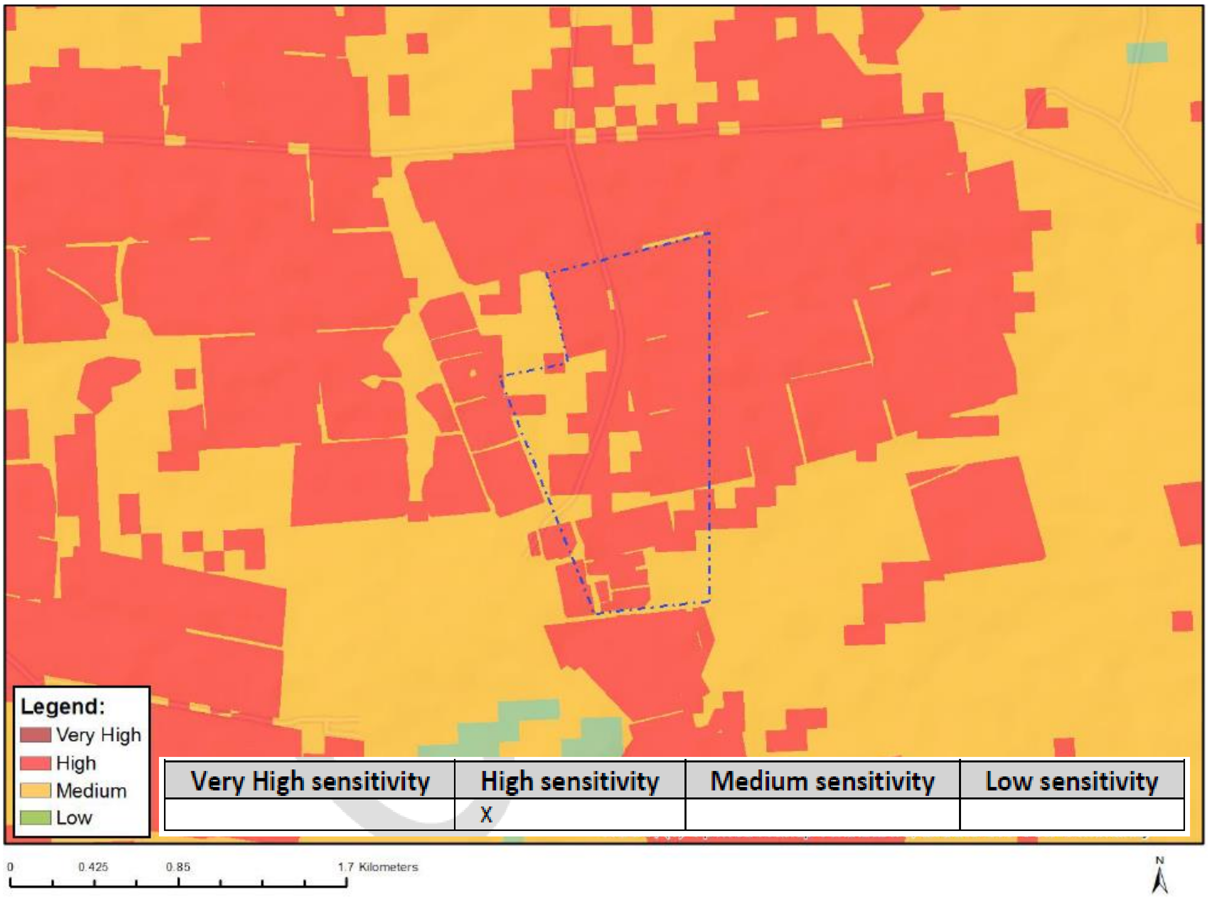

Figure 2: Screening tool sensitivity for the study area.

3. DESKTOP RESULTS AND DISCUSSIONS

3.1 Climatic Data

The study area is located 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 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. Figure 3 shows the mean annual rainfall associated with the study area.

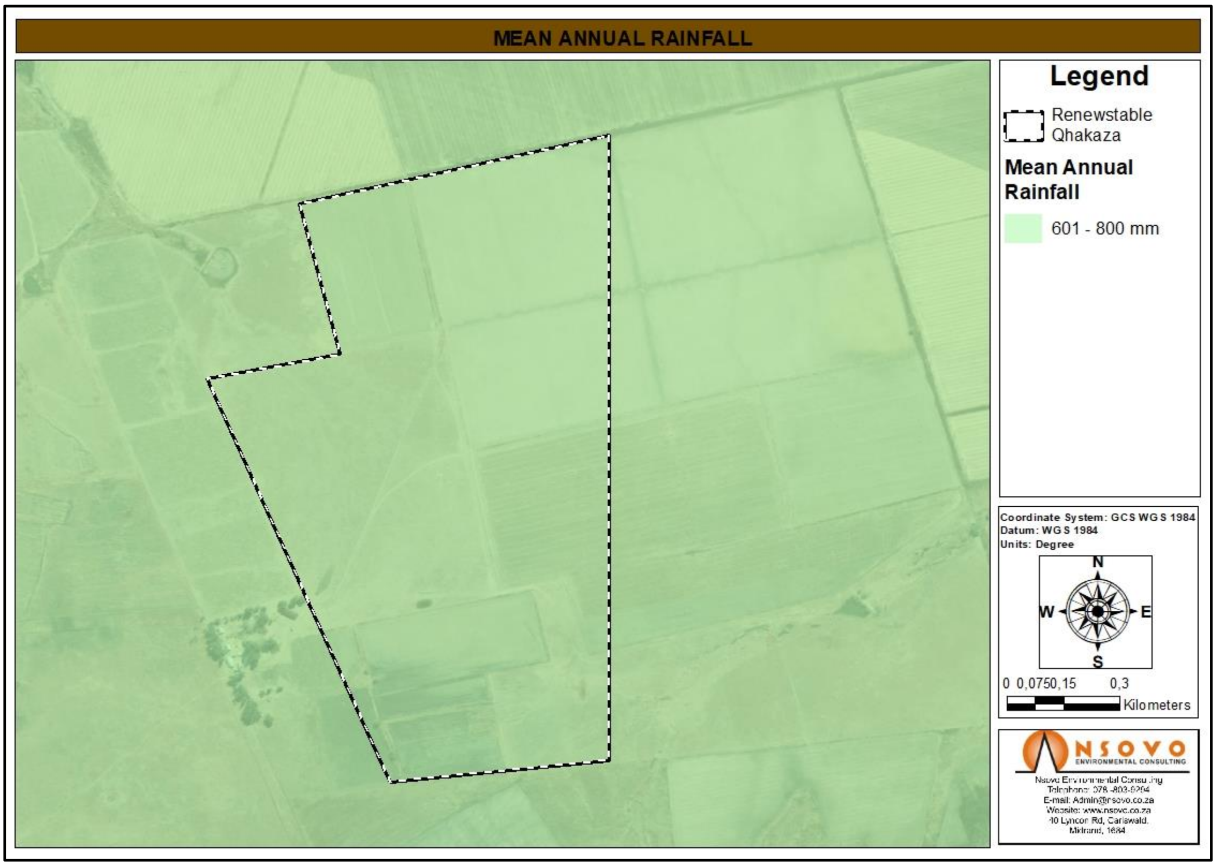

Figure 3: Mean Annual Rainfall associated with the study area.

3.2 GEOLOGY

The soils associated with the entire study area are underlain by the Shale geological formation. Shale is a soft, brittle, fine-grained, and easily eroded sedimentary rock formed from mineral-rich silt, or mud, that was deposited in an aquatic environment, buried by other sediment, and compacted and cemented into hard rock. When exposed at the surface by erosion, shale weathers into thin layers called plates. The shales give rise to clay soils, and hence the freely drained red and yellow-brown soils of the apedal soil patterns. Figure 4, below, depicts the geology associated with the study area.

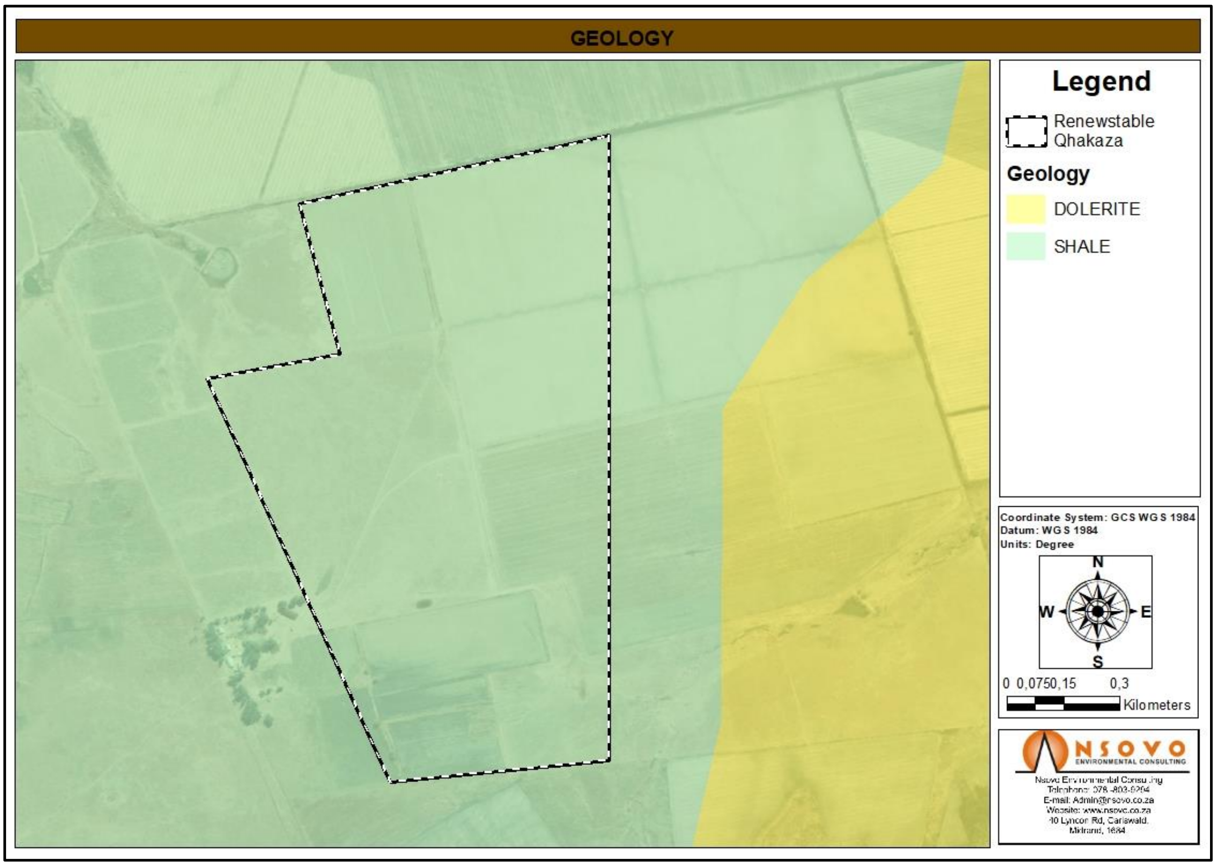

Figure 4: Geological formations associated with the study area.

3.3 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 fertilisers. Figure 5 below depicts the soil pH associated with soils occurring within the study area.

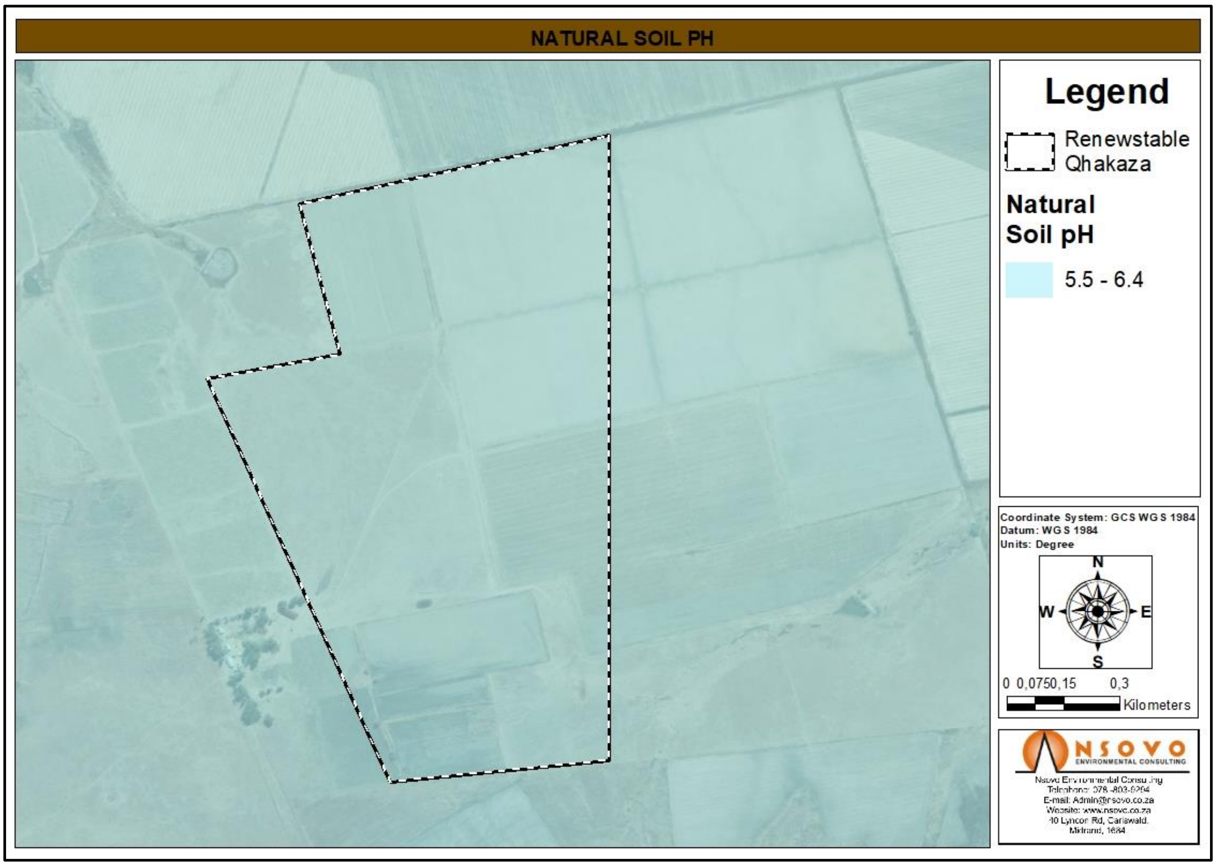

Figure 5: Soil pH associated with the project area.

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 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 6 below illustrates the SOTER Dominant soils associated with the study area.

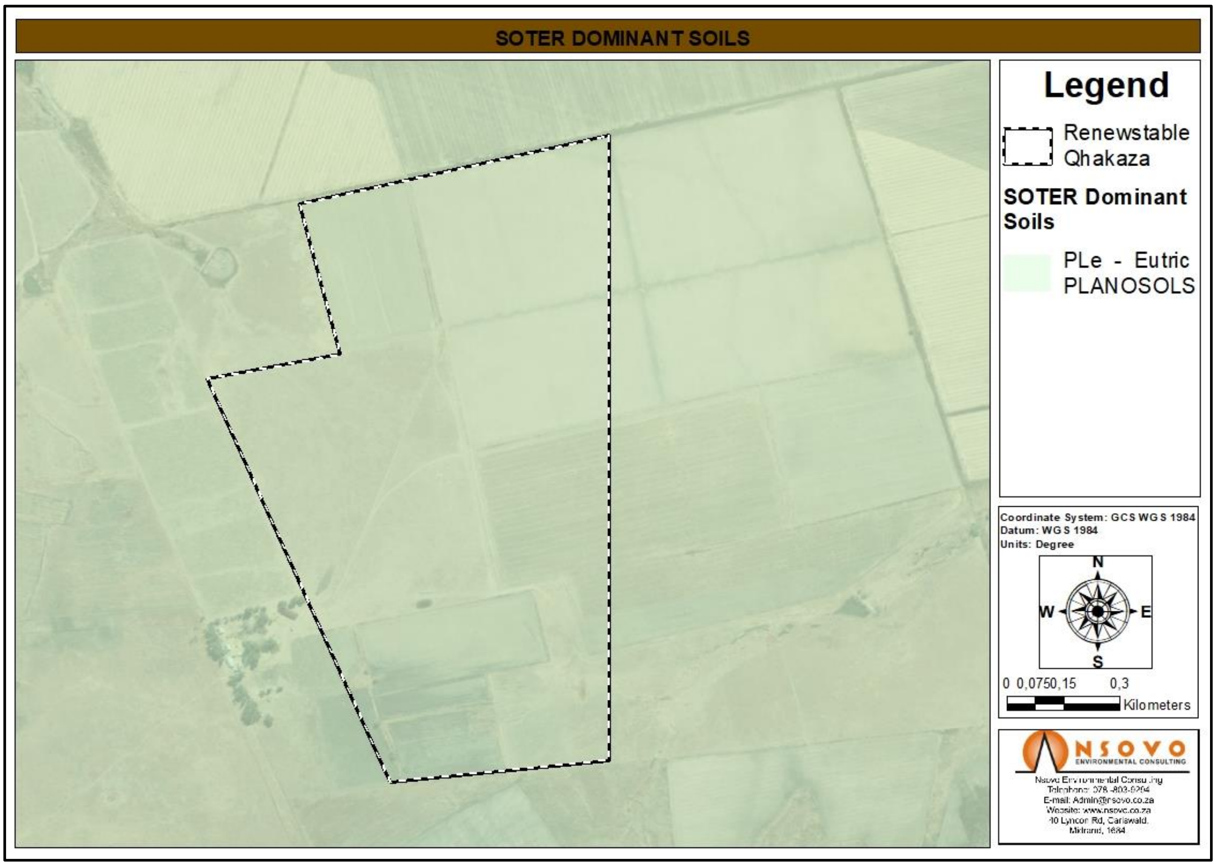

Figure 6: SOTER dominant soils associated with the study area.

3.6 Landtype Classes

The Ca landtypes associated with the study area are the Ca2 Landtype. The Ca landtypes are characterised by are characterised by 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 and thus limiting the choice of crop. Figure 7 blow depicts the landypes classes associated with the study area.

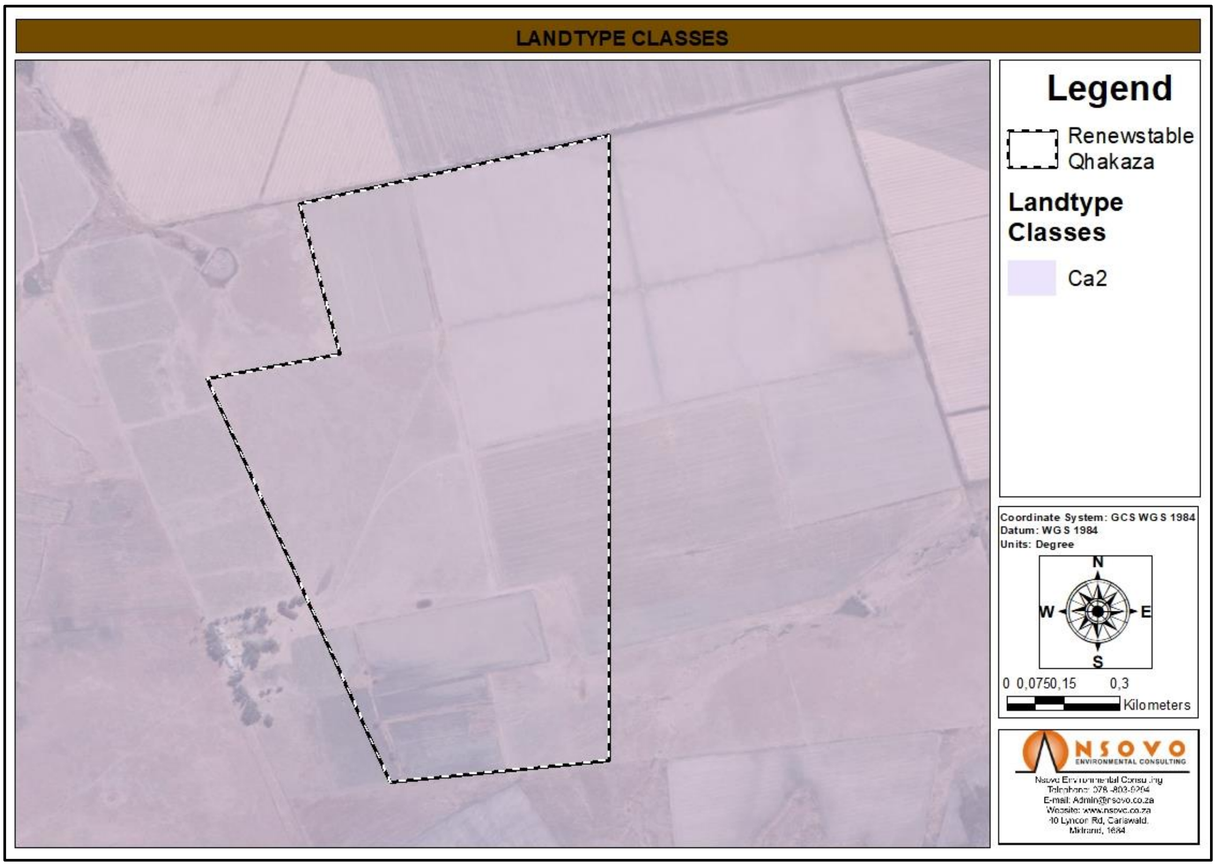

Figure 7: Desktop land capability associated with the study area.

3.7 Desktop Land Capability

The desktop land capability associated with the soils within the study area is non-arable, grazing, woodland, or wildlife capability (Class VII). Figure 8 below shows this capability.

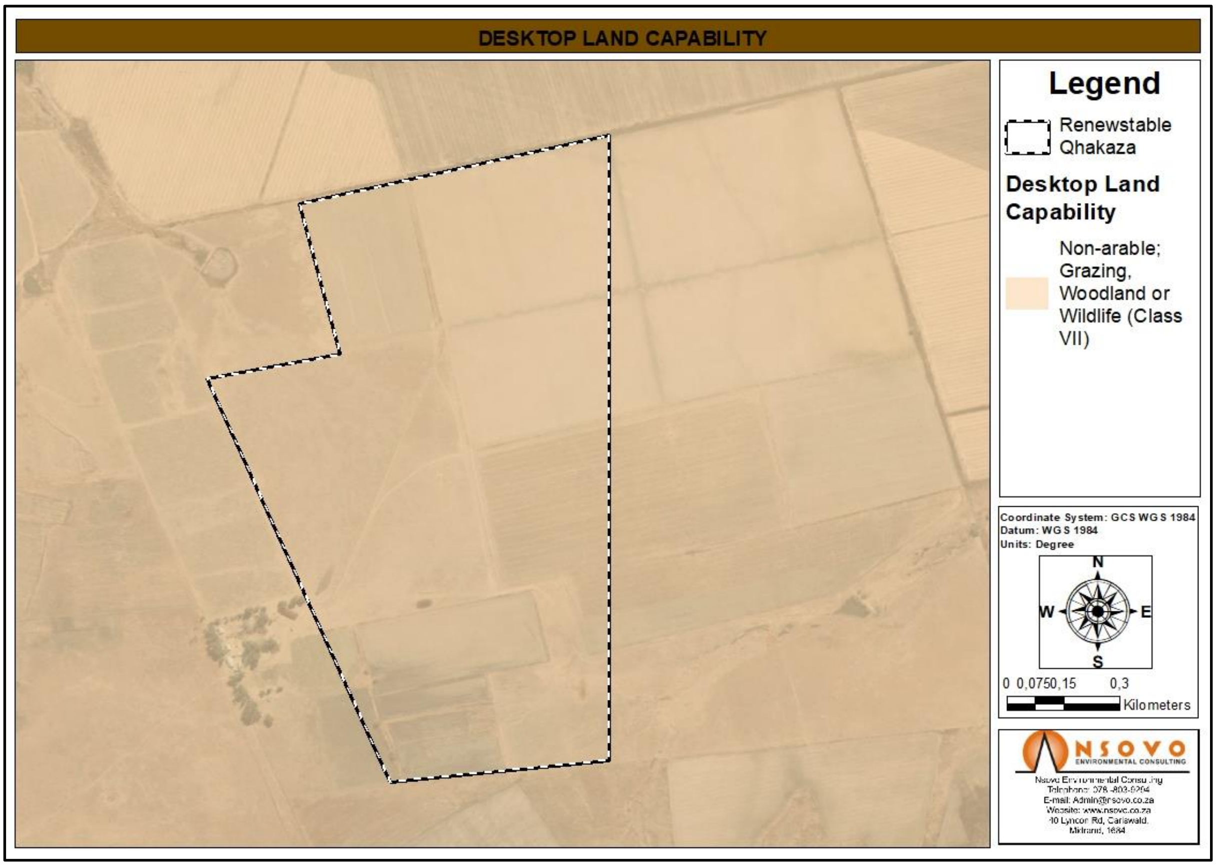

Figure 8: Soil potential associated with the study area.

3.8 Soil Potential

The soil potential associated with the study area is not suitable for arable agriculture but suitable for forestry or grazing where climate permits. Figure 9, below, depicts the soil potential associated with the study area.

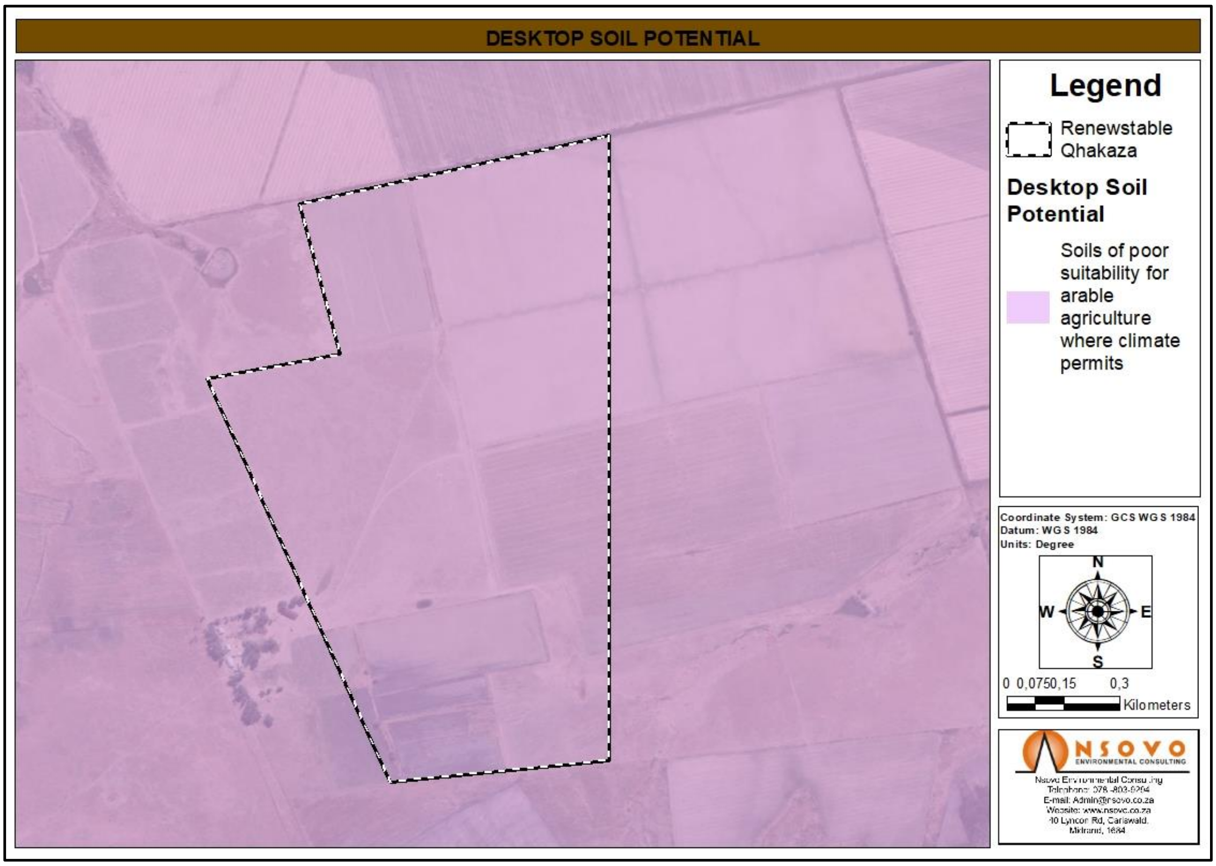

Figure 9: Soil potential associated with the study area.

4. FIELD VERIFIED RESULTS AND DISCUSSIONS

4.1 Land Uses within the Study Area

The study area was primarily dominated by cultivation activities and livestock farming. Figure 10 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, described below. Figures 14 present the spatial distribution of the identified soil forms within each study area. Table 4 present a summary table depicting the area of coverage of each identified soil form.

4.2.1 Mispah/Glenrosa

The Mispah/Glenrosa are typically shallow. The shallow depth can be attributed to limited rock weathering and convex topographical conditions at the crest or scarp of the landscape, instances resulting in soil removal and, in some instances, leaving rocky outcrops behind. These types of soils are usually avoided for intensive use and thus left for grazing, forestry, and wildlife land uses unless intense management strategies are used, such as breaking of the lithic/saprolite layer (as was the case for the Atlanta study area, which cabbage was produced in these soils). The Mispah/Glenrosa soil forms are classified under the Grazing (Class VI) land capability class as they are primarily suited for perennial vegetation and have limitations that preclude cultivation.

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

4.2.2 Mispah/Grabouw

The Mispah/Grabouw soil formation can be characterized as soils which 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 thus has resulted in the original horizon sequence no longer being recognizable and present in disjointed order while remaining within its essential original location. The Mizpah/Grabouw is characterised 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 12: View of the identified Mispah/Grabouw.

4.2.3 Katspruit

The Katspruit soil forms (wetland soils) are generally limited to supporting plants that are 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 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 13: View of the identified Dundee soil forms.

Table 4: Soil forms in hectares (ha) occurring within the study area.

Renewstable Qhakaza Study Area				
Soil Forms	Area (Ha)	Percentage (%)	Land Capability	Agricultural Potential
Glenrosa/Grabouw	72.30	52.2	Arable (Class IV)	Moderate
Katspruit	0.56	0.5	Watercourse (Class V)	Very Low
Mispah/Glenrosa	43.43	37.3	Grazing (Class VI)	Low
Total Enclosed	**116.29**	**100**		

Table 5: Land capability (DAFF, 2016) associated with the soils occurring within the study area.

Soil Form	Land Capability Groups	DAFF (2017) Classification
Glenrosa/Grabouw	Arable Land	8. Moderate
Katspruit	Watercourse	5. Low
Mispah/Glenrosa	Grazing Land	6. Low - Moderate

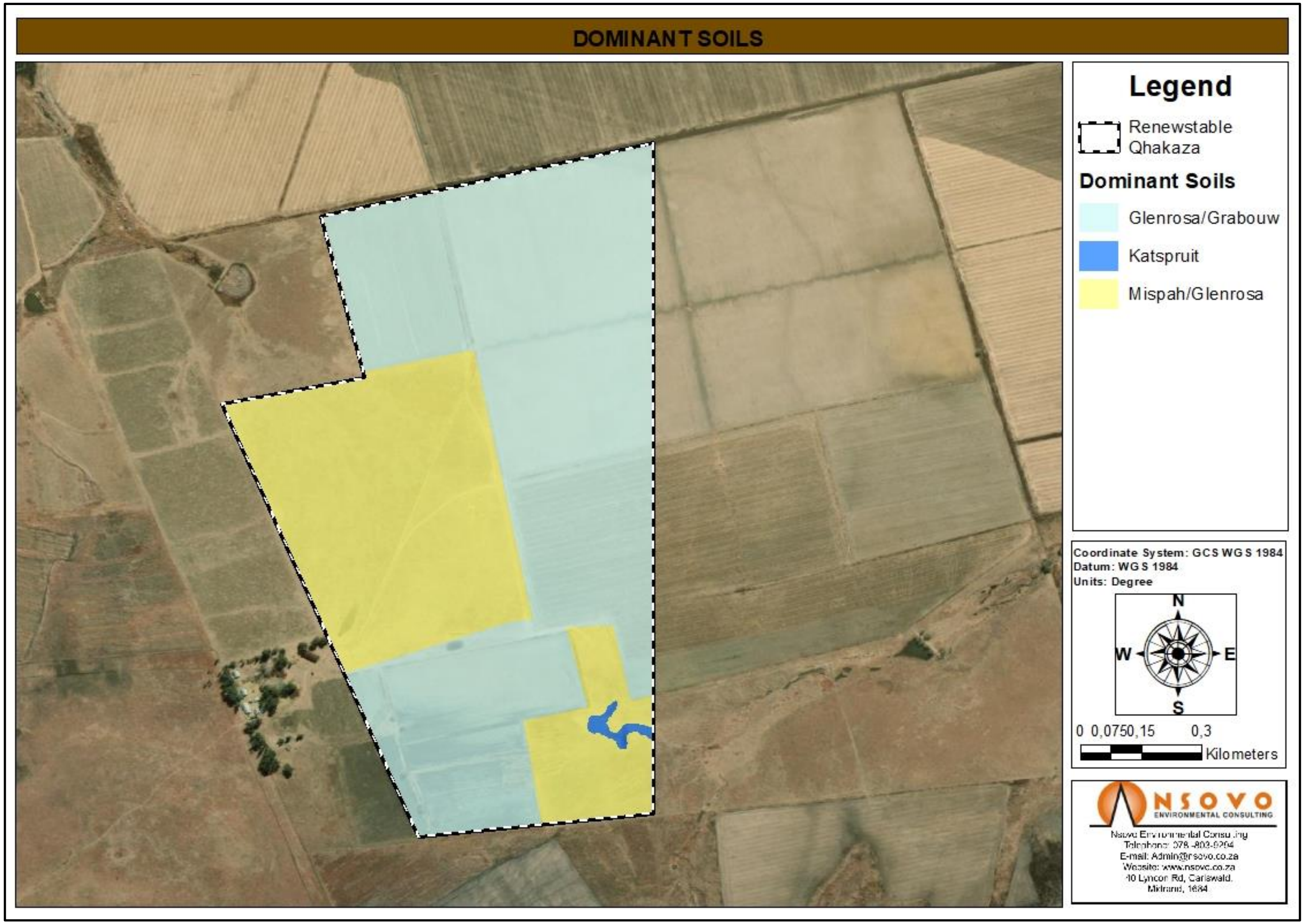

Figure 14: Dominant soils form within the study area.

4.3 Land Capability and Agricultural Potential

Land Capability is defined as the most intensive long-term use of land for 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 were in consideration of observed limitations to land use due to physical soil properties and prevailing climatic conditions. Figure 15 below depicts the land capability and agricultural potential associated with the study area, while Figure 17 depicts the agricultural potential.

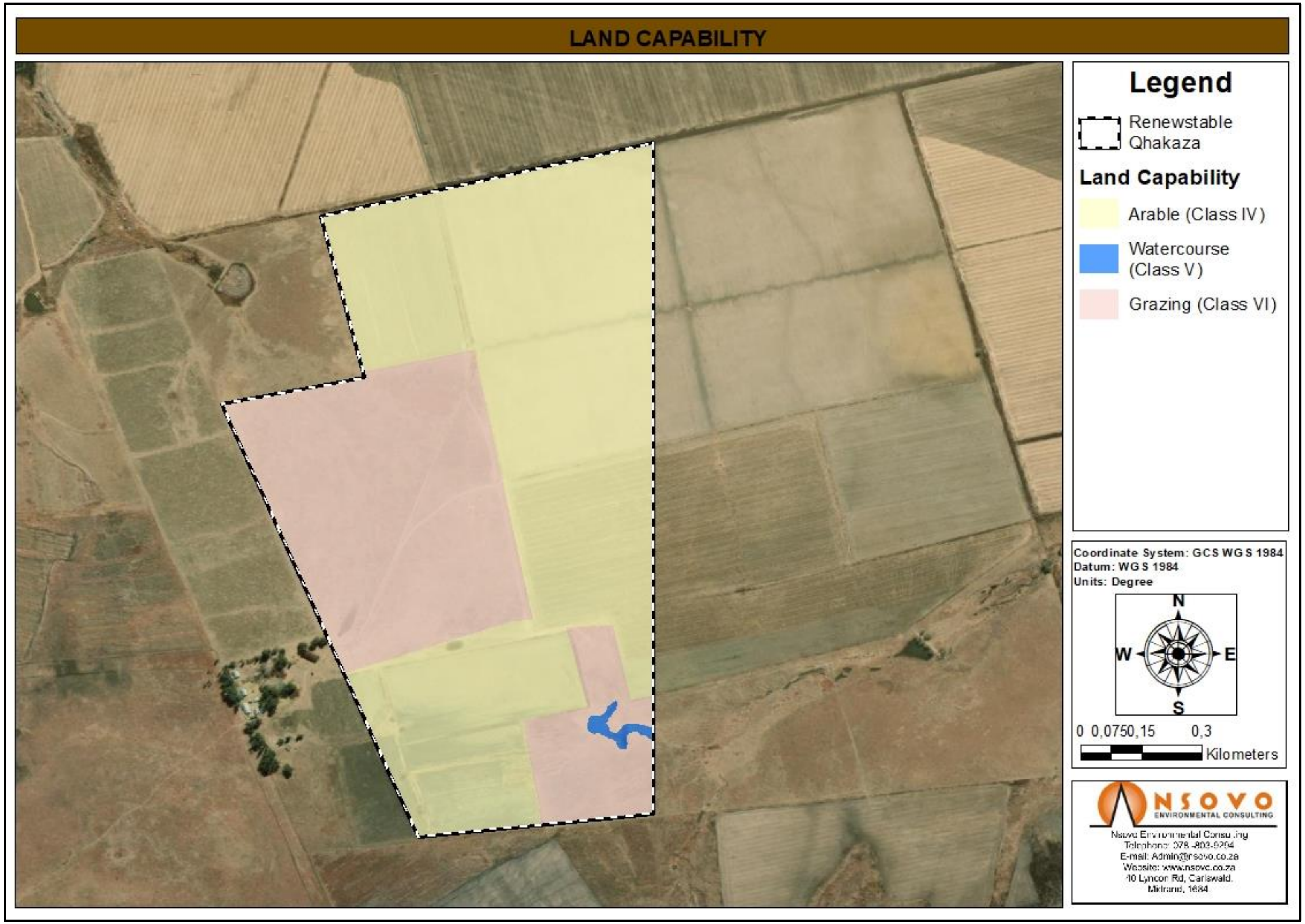

Figure 15: Map depicting land capability of soils within the study area.

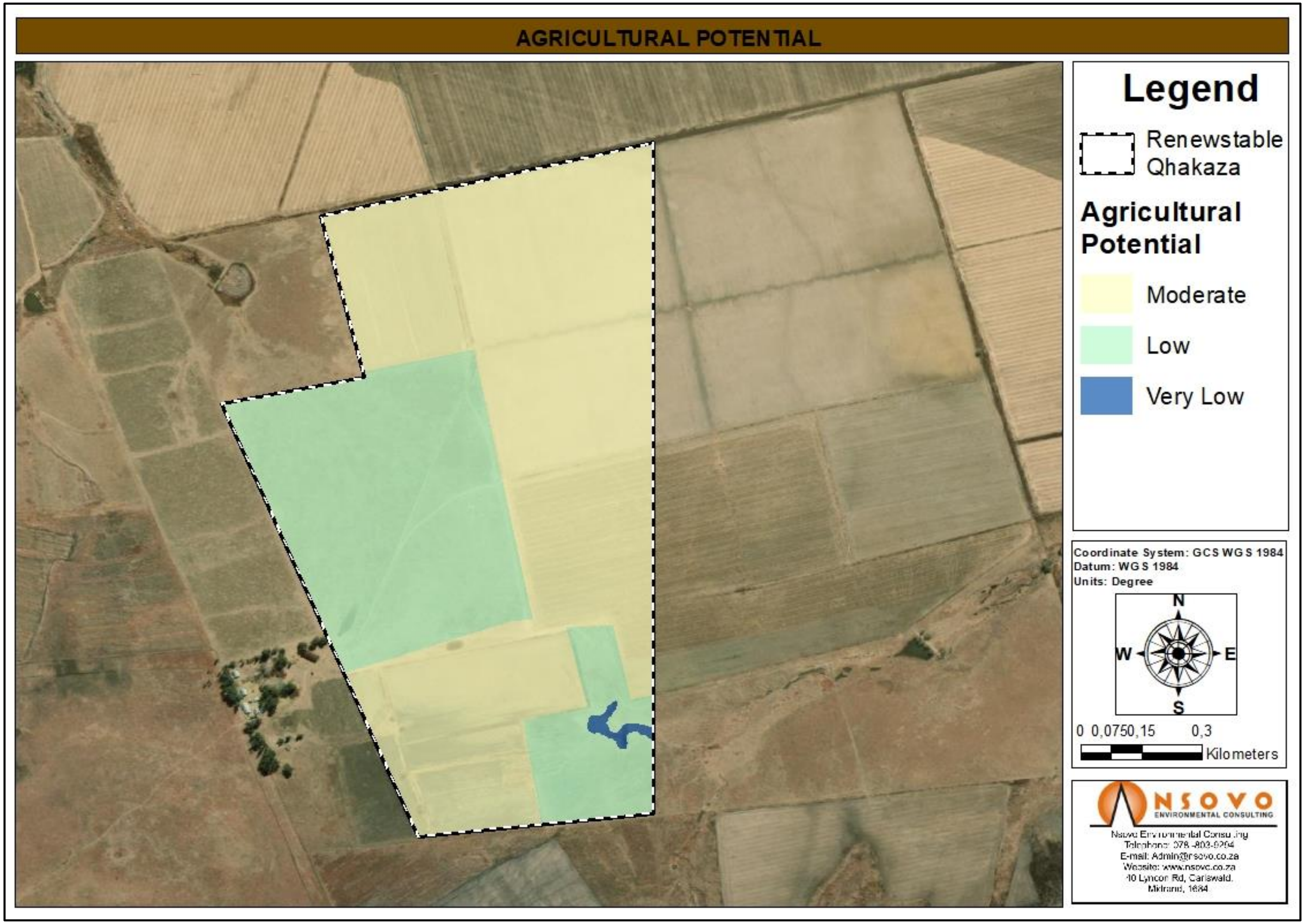

Figure 16: Agricultural potential for soils associated with the study area.

5. IMPACT ASSESSMENT

5.1 Assessment Methodology

According to the NEMA regulations (2014), all impact assessments should provide quantified scores that show the expected impact and those that will likely 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).

Section 5.2 below presents the significance of the impacts that may occur as a result of the proposed activities and a description of the mitigation required to limit the identified negative impacts on the identified soils on site.

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 during earthworks is considered a measurable erosion deterioration. This impact is considered to be localised within the development footprint. If not managed, this impact will be localised within the site boundary and have medium significance on the soil resource.

Soil chemical pollution caused by potential oil and fuel spillages from vehicles is considered to be a moderate deterioration of the soil resource. If not managed, 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 as a result of heavy vehicles commuting on the existing roads and any newly constructed access road to increase access to the solar PV plant and the hydrogen plant. Without mitigation measures, the impacts will be localised within the site boundary with medium consequence and significance.

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 on soil, land use and land capability include the following:

- General activities including transport on access roads that 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 topsoil to increase 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 6: 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 disturbances of soils resulting in loss of land capability.							
No Corrective Measures		Neg	2	4	6	3	36

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 prior to the commencement of maintenance activities.							
To minimise the likelihood of potential soil contamination, the solar panels should be cleaned with clean water and chemicals avoided.							
Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion.							
Make use of geotextiles and contours to control soil erosion and revegetation of 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 de-compacted, and any excavations backfilled with soil to restore the site for future use.							

Table 7: 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 of 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 should be kept within the demarcated footprint areas as far as 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 to reduce runoff-induced erosion.							
Make use of geotextiles and contours to control soil erosion and revegetation of exposed soil surfaces where possible.							
Water needs to be considered for dust suppression, and 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 at 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 disturbances of soils resulting in loss of land capability.							
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 hydrocarbon leakages before commencement of maintenance activities.							
To minimise the likelihood of potential soil contamination, the solar panels should be cleaned with clean water and chemicals avoided.							
Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion.							
Make use of geotextiles and contours to control soil erosion and revegetation of 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 8: 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 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 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 soil to restore the site for future use.							

Table 9: 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 plants leads to alteration of the soil chemical status as well as contamination of groundwater. 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 should be kept within the demarcated footprint areas as far as 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 spills containment and soils clean up.							
Decommissioning Phase							
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 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 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.							

5.4 Gross Agricultural Income from the Study Area

Based on on-site observations, the majority of the study area was transformed from natural grazing to cultivation through deep in-situ ripping. Thus, the area under which maize cultivation was observed was where the soils of Mispah/Grabouw were observed, which account for 72.30 ha. The potential annual gross income generated from the land was calculated using the long-term maize yields of 4 tons per hectare obtained from the NAR Atlas manual.

Production figures for areas under dryland agriculture:

Cultivated area =72.30 ha

Expected yield = 4 tons/ha

Total yield = 72.30 ha * 4 tons/ha

= 289.2 tons

Price of Maize = R4105/ton

Financial Yield =289.2 * 4105

= R1 187 166 per production season (before input costs are considered)

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 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.

Although the loss of agricultural soils and the permanent change in land use will be localised to within the study area, the cumulative loss of agricultural resources locally and regionally is considered to be moderate without mitigation and low with mitigation measures. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of high-potential agricultural soils. Therefore, integrated mitigation measures must be implemented accordingly, to minimise the potential loss of these valuable soils considering the need for sustainable development. Mixed land use, such as sheep grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy.

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 10 below.

Table 10: Summary of the screening tool vs specialist-assigned sensitivities.

SITE SENSITIVITY VERIFICATION			
	Screening Tool		Site Verification Outcome
Renewstable Qhakaza 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 the overall potential cumulative impacts of renewable energy projects. These projects are presented in Table 11 below.

Table 11: Known renewable energy projects within a 50 km radius of the proposed Renewstable Qhakaza 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

Project Title	DEA_REF	NEAS_REF	APPLICANT
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 portion 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 portion 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 10 of the farm Schurvepoort 63-HS in the province of Mpumalanga, South Africa (henceforth referred to as study area).

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.

Although the loss of agricultural soils and the permanent change in land use will be localised within the study area, the cumulative loss of agricultural resources locally and regionally is considered moderate without mitigation and low with mitigation measures. It is the opinion of the specialist that the unmitigated scenario poses a threat to the sustainability of high-potential agricultural soils. Therefore, integrated mitigation measures must be implemented accordingly to minimise the potential loss of these valuable soils, considering the need for sustainable development. Mixed land use, such as sheep grazing between solar arrays, should be considered to retain agricultural production while generating renewable energy.

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.

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 related to the site to be affected, *in situ* fieldwork, surveys, and 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 as well as 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, serves to confirm acknowledgment of these terms and liabilities.

Tshiamo Setsipane

11 September 2024

APPENDIX B: IMPACT ASSESSMENT METHODOLOGY

The assignment of significance ratings has been undertaken based on experience of the EIA team, as well as through research. Subsequently, mitigation measures have been identified and considered for each impact and the assessment repeated in order 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 the 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 implement to manage the anticipated impacts and to 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 flowpaths 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