DRAFT SOIL, LAND USE, AND LAND CAPABILITY (AGRICULTURE IMPACT) ASSESSMENT: ESKOM KEKANA SUBSTATION AND LOOP IN & LOOP OUT POWERLINE SERVITUDES IN HAMMANSKRAAL WITHIN THE CITY OF TSHWANE METROPOLITAN MUNICIPALITY IN GAUTENG PROVINCE.

REF: AGR_KEKANA_24

DATE OF FIRST DRAFT:

06 JUNE 2024

PREPARED FOR

ESKOM HOLDINGS SOC LIMITED

PREPARED BY

NSOVO ENVIRONMENTAL CONSULTING

"From the world we live to the world we seek"

40 Lyncon Road,
Carlswald Midrand,
1684
Tel: 087 803 2369
Email: admin@nsovo.co.za

DOCUMENT CONTROL

Report Name	Soil, Land Use, and Land Capability (Agriculture Impact) Assessment: For the proposed Eskom Kekana Substation and Loop In & Loop Out Powerline Servitudes in Hammanskraal Within the City Of Tshwane Metropolitan Municipality In Gauteng Province.
Reference	Nsovo Environmental Consulting cc
Version	Draft Report_V01
Submitted to	Eskom Holdings SOC Ltd
Author	Tshiamo Setsipane
Reviewer	Munyadziwa Rikhotso
Draft Date Produced	06 June 2024

EXECUTIVE SUMMARY

Nsovo Environmental Consulting was appointed to conduct a soil, land use, and land capability assessment as part of the Environmental Impact Assessment (EIA) process for the proposed Eskom substation and loop-in and loop-out powerline servitudes in Hammanskraal within the city of Tshwane Metropolitan Municipality in Gauteng Province, South Africa. Three (3) powerline and substation alternatives were considered for the proposed development, and each alternative has an associated 400 meter (m) assessment corridor (i.e., 200 m on either side of the proposed development) and will henceforth be referred to as the “study area” unless referring to individual alternatives.

The Detailed Scope of Work includes:

- **Servitude Project**
    - Kekana Substation Site
        - Servitude acquisition for the proposed Kekana 132/22kV substation,100x150m Site.
- **Kekana –Pelly-Temba Main loop in-loop out**
    - Acquire 31m wide servitude for the approximate 7km 132kV double circuit loop-in-loop-out line from the existing Pelly-Temba Main 132kV line to the Kekana substation.

The study area falls within the humid subtropical climate characterised by hot and humid summers and cool to mild winters. Most summer rainfall occurs during thunderstorms that build up due to the intense surface heating and subtropical solid sun angle. The mean annual rainfall ranges between 401- and 601 mm; this rainfall is not deemed adequate to support rainfed agriculture and planting dates, and the length of the growing season may be affected and needs to be carefully considered.

Based on the observations during the site assessment, the dominant soils occurring within the study area are Mispah Glenrosa, Grabouw, Dundee, and Gleylithic Glenrosa (associated with the watercourse), and Witbank. The majority of the soils occurring within the study area do not meet the conditions for agricultural suitability to a certain extent, and these conditions include:

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

Tables A, B, and C below depict the summary findings of the soils identified for each considered alternative and their respective land capability and agricultural potential status.

Table A: Soil forms in hectares (ha) occurring within the preferred alternative study area.

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	140.47	48.28	Grazing (Class VI)	Low	5. Low
Grabouw	19.02	6.53	Arable (Class IV)	Moderately High	9. Moderate to High
Dundee	3.84	1.32	Watercourse (Class V)	Very Low	3. Very Low to Low
Glenrosa (Gleylithic)	16.77	5.76			
Witbank	110.96	38.12	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	**291.05**	**100**			

Table B: Soil forms in hectares (ha) occurring within the Kekana alternative 2 study area.

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	341.63	89.09	Grazing (Class VI)	Low	5. Low
Grabouw	19.97	5.21	Arable (Class IV)	Moderately High	9. Moderate to High
Dundee	13.83	3.61	Watercourse (Class V)	Very Low	3. Very Low to Low
Witbank	8.06	2.10	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	**383.48**	**100**			

Table C: Soil forms in hectares (ha) occurring within the Kekana alternative 3 study area.

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	344.92	95.99	Grazing (Class VI)	Low	5. Low
Dundee	13.23	3.68	Watercourse (Class V)	Very Low	3. Very Low to Low
Witbank	1.17	0.33	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	**359.32**	**100**			

The identified development footprint areas (preferred, alternative 2 and 3) present areas characterized mainly by shallow soils (Mispah/Glenrosa), followed by soils intentionally altered to favour agricultural cultivation (Grabouw), soils with wetness characteristics (Dundee and Gleylithic Glenrosa) lastly, disturbed areas due to human activities in the form of earthworks (Witbank), and areas of active cultivation were observed outside the development footprint areas. Therefore, most soils identified within the study area are largely unsuitable for agricultural cultivation due to their inherent soil properties unless intense management strategies are utilized, such as deep in-situ ripping of the lithic layer below the topsoil.

The agricultural practices within the study area include soybean cultivation (as identified during the site visit), which utilises the centres pivot irrigation techniques, producing high-value crops. Furthermore, despite not being approved, the Preservation and Development of Agricultural Land Framework Bill published on September 18th, 2020, automatically considers land under irrigation to have high potential. This is based on the high production capacity of irrigated agriculture, which is critical for food security at a local and regional scale. It is common for irrigated areas to indicate a high capital investment on the farm.

The land capability of the surrounding soils and the agricultural potential are very low to moderately high due to adequate climatic conditions (i.e., rainfall, temperature), availability of irrigation water, and appropriate slope, which allows for intensive commercial agricultural practices.

That said, the proposed Eskom Kekana substation and powerline servitudes project is anticipated to have a negligible impact on agriculture because the actual footprint of disturbance of the substation infrastructure is located away from any agriculturally active areas. Also, the footprint of disturbance that precludes agricultural land use constitutes only a negligible proportion of the available land surface area. All agricultural activities can continue completely unhindered underneath the powerline. Consequently, any of the three (3) alternatives can be utilised for the proposed project. The development's only possible impact was minimal soil and land degradation because of land disturbance during construction and decommissioning.

However, the three alternatives were ranked in terms of their sensitivities, and the preferred alternative is likely to have the most negligible impact as the preferred alternative because of its proximity to the residential areas where no agricultural activities are taking place at a larger scale and the relatively short distance of the powerline servitude as compared to the other alternatives. Table 8 below depicts the ratings associated with the proposed alternatives.

Table C: Preferred alternatives based on the outcomes of the assessment.

Preference	Corridor
1st Preference	Preferred Alternative
Second Preference	Alternative 3
Third Preference	Alternative 2

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

DECLARATION OF INDEPENDENCE

- I, Tshiamo Setsipane, in my capacity as a specialist consultant, hereby declare that I:
- Act/acted as an independent specialist to Eskom Holdings 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.
- I do not object to or endorse the proposed developments, but I aim to present facts and my best scientific and professional opinion about their impacts.
- 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.

(*Pr. Nat. Sci* 114882)

DOCUMENT GUIDE

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

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

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

No.	NEMA Regs (2014)- Appendix 6	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, expressed as an annual figure and broken down into production units;	Section 6

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	N/A
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;	Munyadzi CV
2.7.2	A signed statement of independence by the specialist;	Munyadzi
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 6

2.7.7	An indication of possible long-term benefits that the project will generate 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.**	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Nsovo Environmental Consulting was appointed to conduct a soil, land use, and land capability assessment as part of the Environmental Impact Assessment (EIA) process for the proposed Eskom substation and loop-in and loop-out powerline servitudes in Hammanskraal within the city of Tshwane Metropolitan Municipality in Gauteng Province, South Africa. Three (3) powerline and substation alternatives were considered for the proposed development, and each alternative has an associated 400-meter (m) assessment corridor (i.e., 200 m on either side of the proposed development) and will hereafter be referred to as the “study area” unless referring to individual alternatives. Figures 1 and 2 below depict the locality of the study area in relation to the surrounding areas.

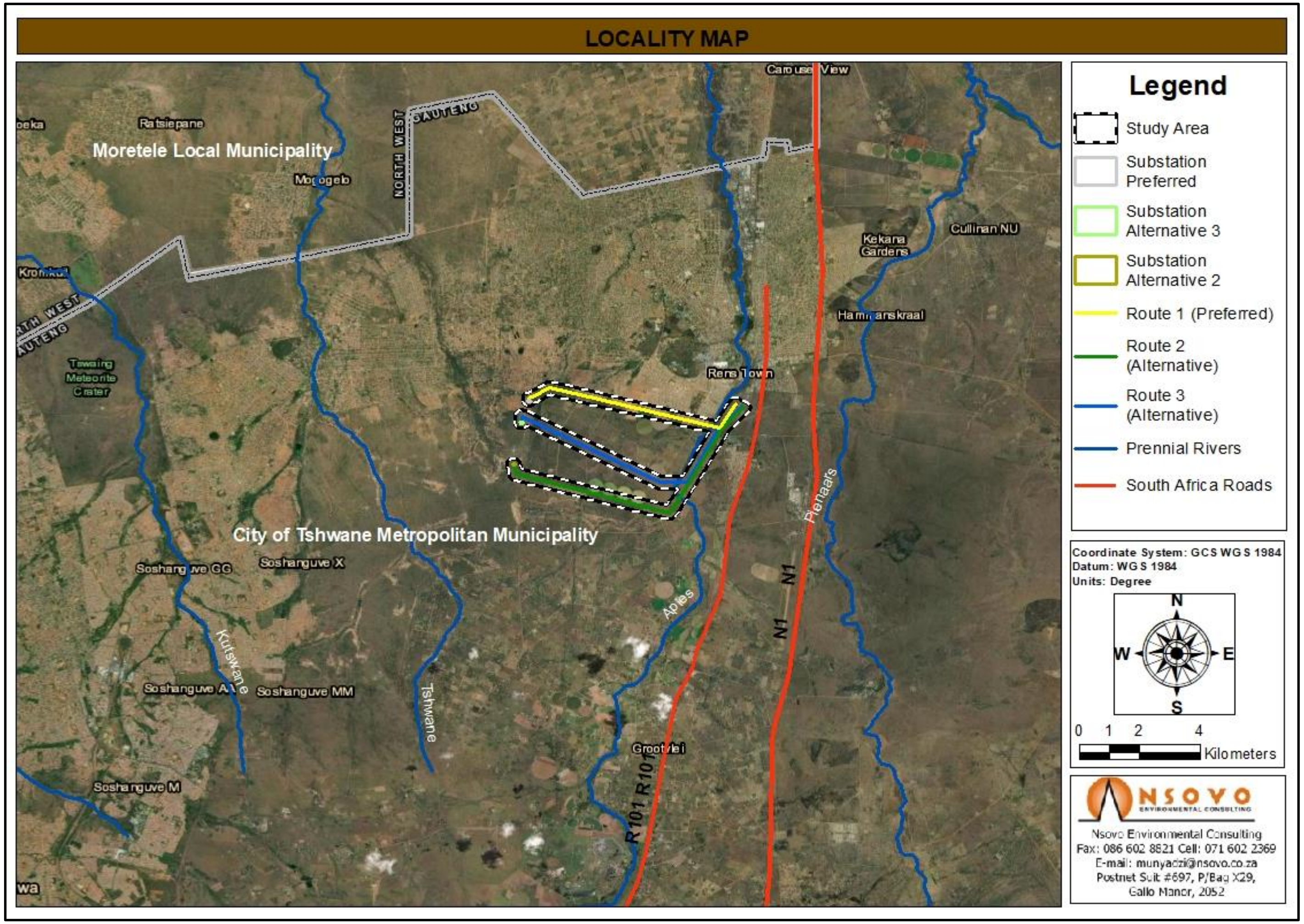

Figure 1: Locality of the study area in relation to the surrounding areas.

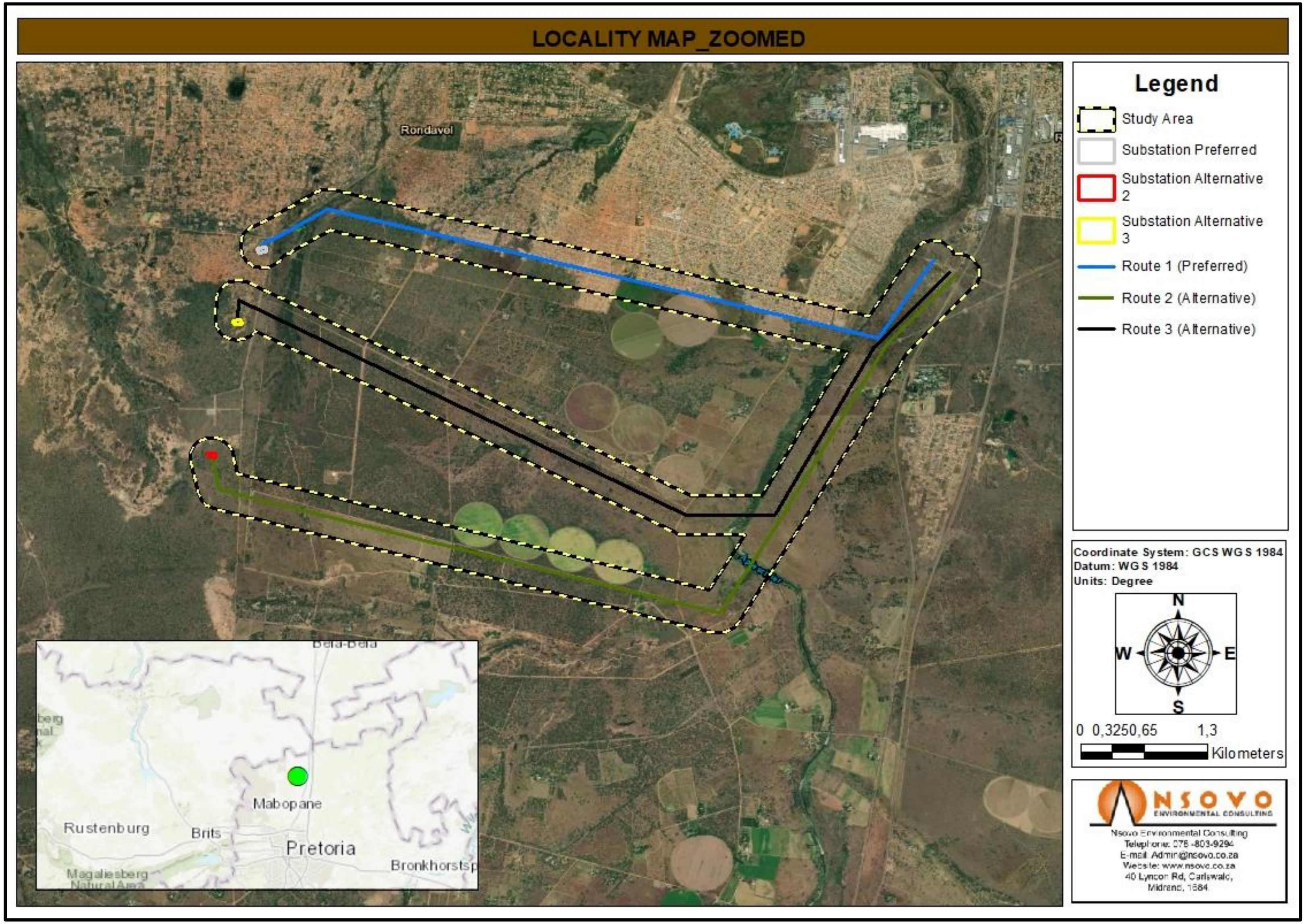

Figure 2: Zoomed locality of the study area in relation to the surrounding areas.

1.1 PROJECT DESCRIPTION

The Detailed Scope of Work includes:

- **Servitude Project**
  - Kekana Substation Site
    - Servitude acquisition for the proposed Kekana 132/22kV substation,100x150m Site.
- **Kekana –Pelly-Temba Main loop in-loop out**
  - Acquire 31m wide servitude for the approximate 7km 132kV double circuit loop-in-loop-out line from the existing Pelly-Temba Main 132kV line to the Kekana substation.

1.2 AIMS AND OBJECTIVES OF THE STUDY

The objective of the Soil, Land Use, and Land Capability is to fulfill and align the proposed project with the requirements of the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) of South Africa. This act aims to promote the conservation of soil, water sources, 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 soils, 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 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 minimize the negative impacts anticipated from the proposed development and
- Compile soil, land use, and land capability reports based on the field-finding data under current 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;
- Certain farm portions could not be accessed due to owners' declining to grant access, locked gates and fear of trespassing, 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 conducted before beginning the field assessment to gather the study area's predetermined soil, land use, and land capability data. The data was sourced from the Soil and Terrain(SOTER) database and the Natural Agricultural Atlas of South Africa Version 3: (https://ndagis.nda.agric.za/portal/apps/webappviewer/index.html?id=8b72eb2a25c04660a1ab2b562f6ec0bf)

2.2 Site Survey

A desktop assessment was followed by a field investigation to validate the predetermined soil results obtained at the desktop level. The field survey was conducted over 2 days in March 2024, wherein soil auger tests were conducted, and soils were classified into soil forms according to the Soil Classification System: A Natural and Anthropogenic System for South Africa Soil Classification System (2018). It must be noted that the season has no bearing on the soil's morphological properties over a short-term period.

2.3 Land Capability Classification

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

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

Eight land capability classes were employed with potential decreases and 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
Wildlife	VIII										Extremely severe limitations. Not suitable for grazing or afforestation.

The updated and refined land capability ratings and database for South Africa was released by the Department of Fishery and Forestry (DAFF) in 2016 and now the Department of Agriculture, Land Reform and Rural Development (DALRRD). 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 3 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, 2016). Soil agricultural potential is impacted by several factors (see Table 2 below). The soil agricultural potential was evaluated based on the factors mentioned and described in Table 3 by assigning qualitative criteria ratings such as High, Moderate, or Marginal to low to the updated land capability ratings.

Table 2: National Land Capability Values (DAFF, 2016).

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 its potential 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 in light of the proposed land use change (the transition from potential agricultural land to the proposed development is sufficiently considered). The information in this report aims to enable the Competent

Authority (CA) to make 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 or not 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 each alternative is presented in Figures 3, 4, and 5 below:

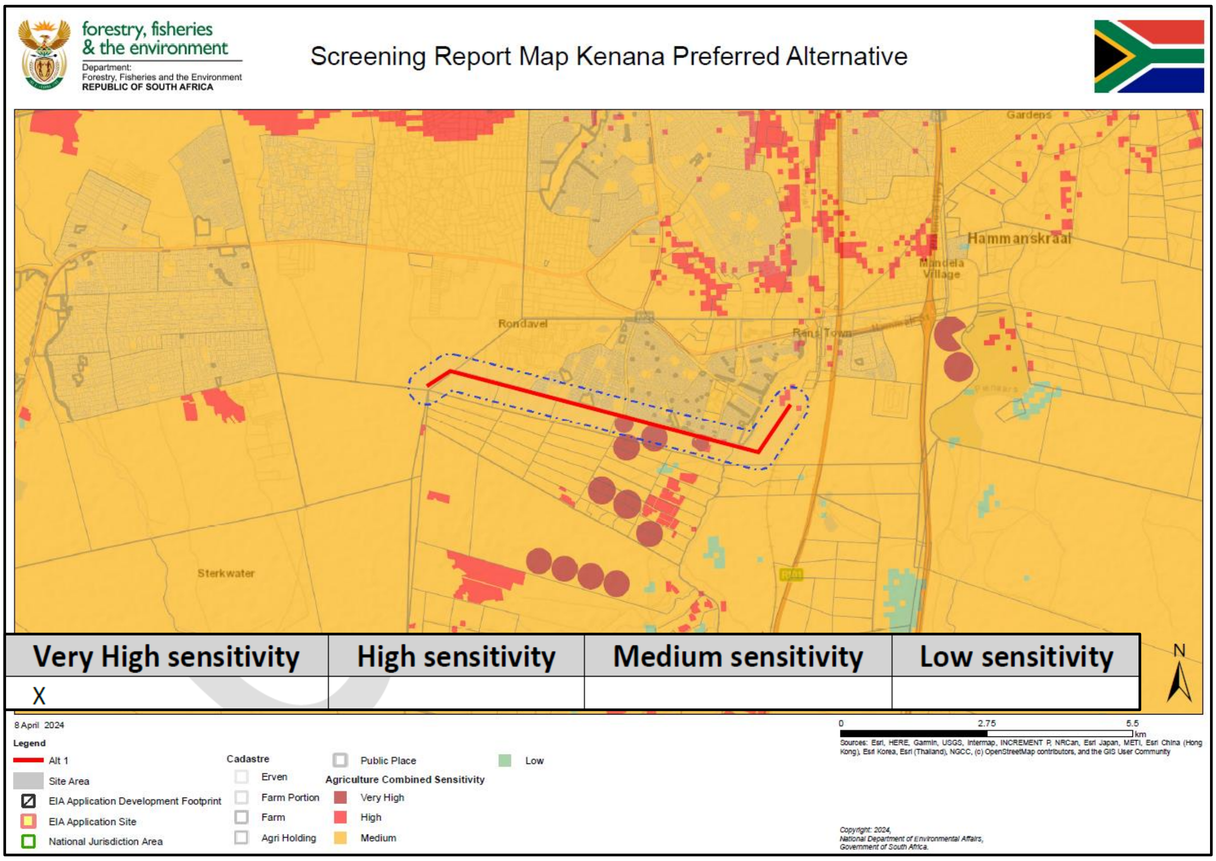

Figure 3: Screening tool sensitivity is the preferred alternative.

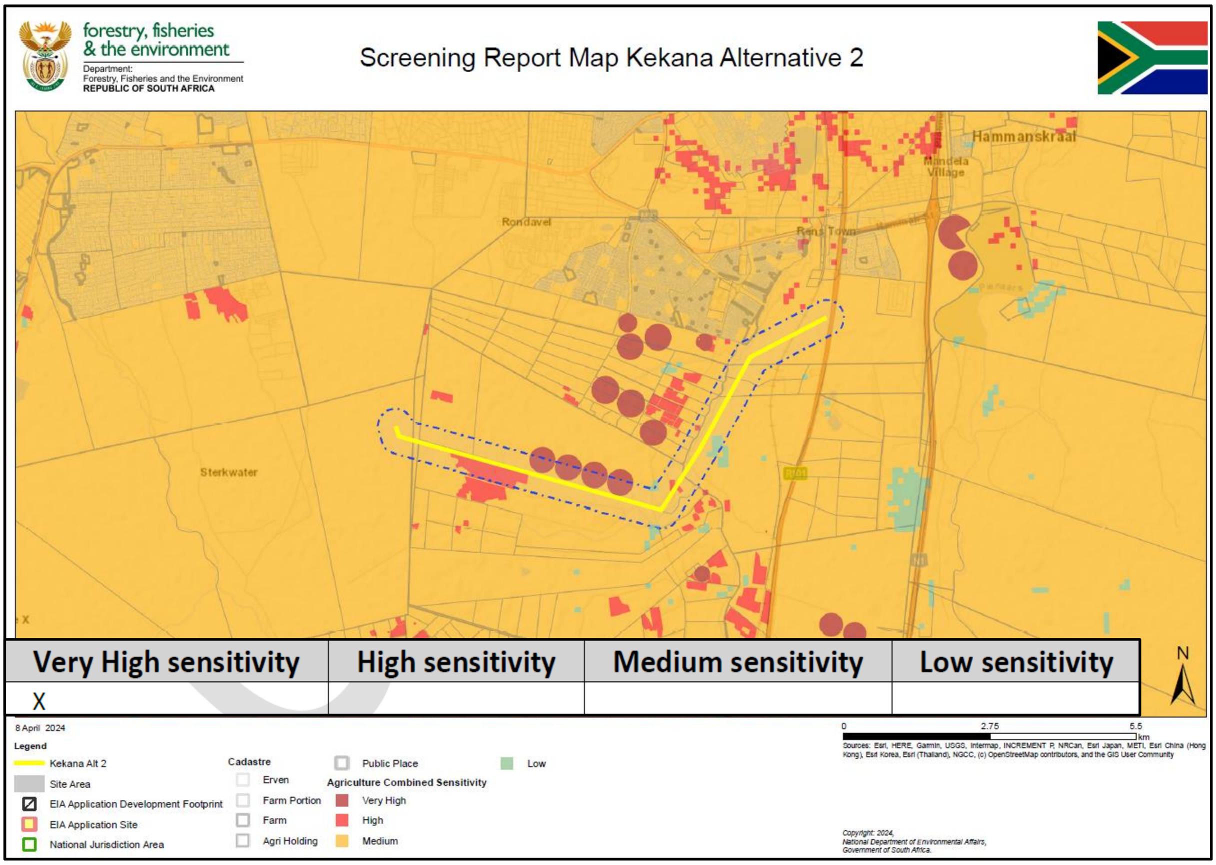

Figure 4: Screening tool sensitivity for Kekana alternative 2.

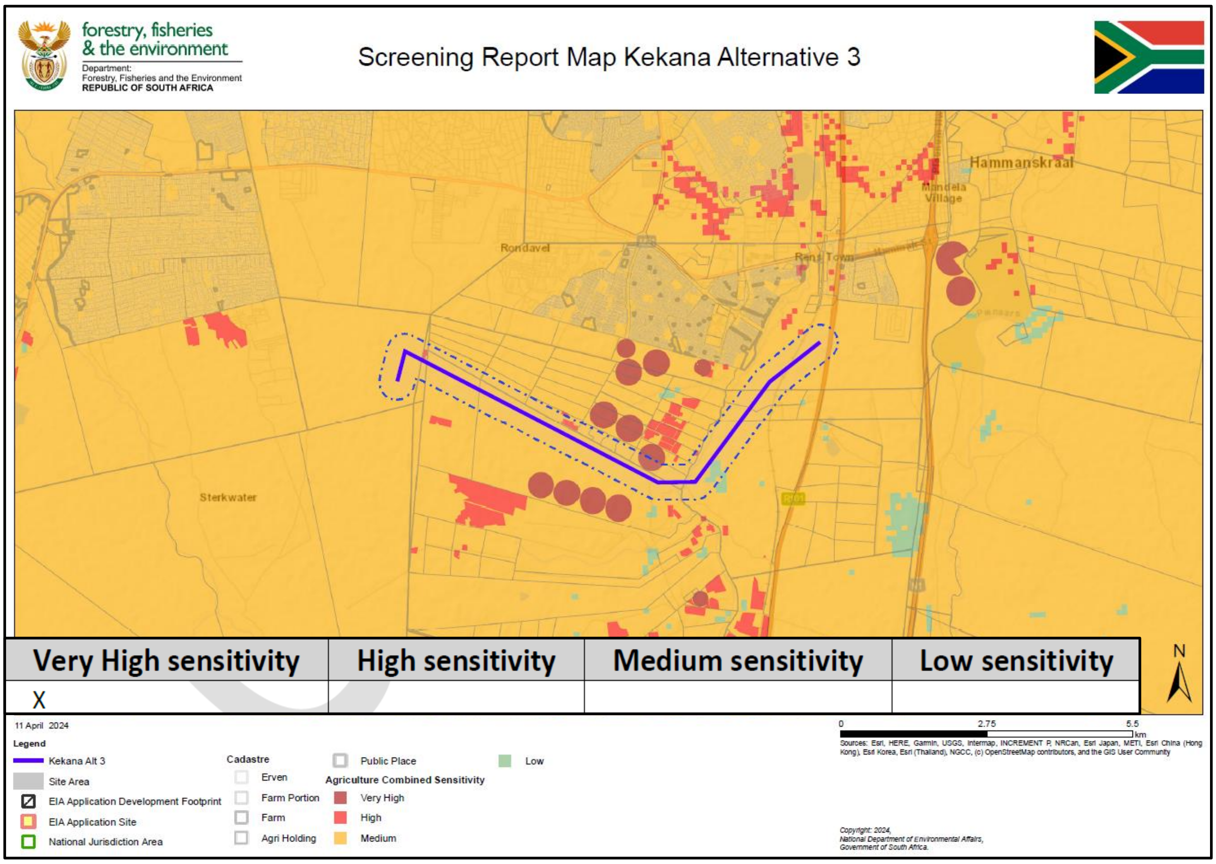

Figure 5: Screening tool sensitivity for Kekana alternative 3.

3. DESKTOP RESULTS AND DISCUSSIONS

3.1 Climatic Data

The study area falls within the humid subtropical climate characterised by hot and humid summers and cool to mild winters. Most summer rainfall occurs during thunderstorms that build up due to the intense surface heating and subtropical solid sun angle. The mean annual rainfall ranges between 401- and 601 mm; this rainfall is not deemed adequate to support rainfed agriculture and planting dates, and the length of the growing season may be affected and needs to be carefully considered. Figure 6 depicts the mean annual rainfall associated with the study area.

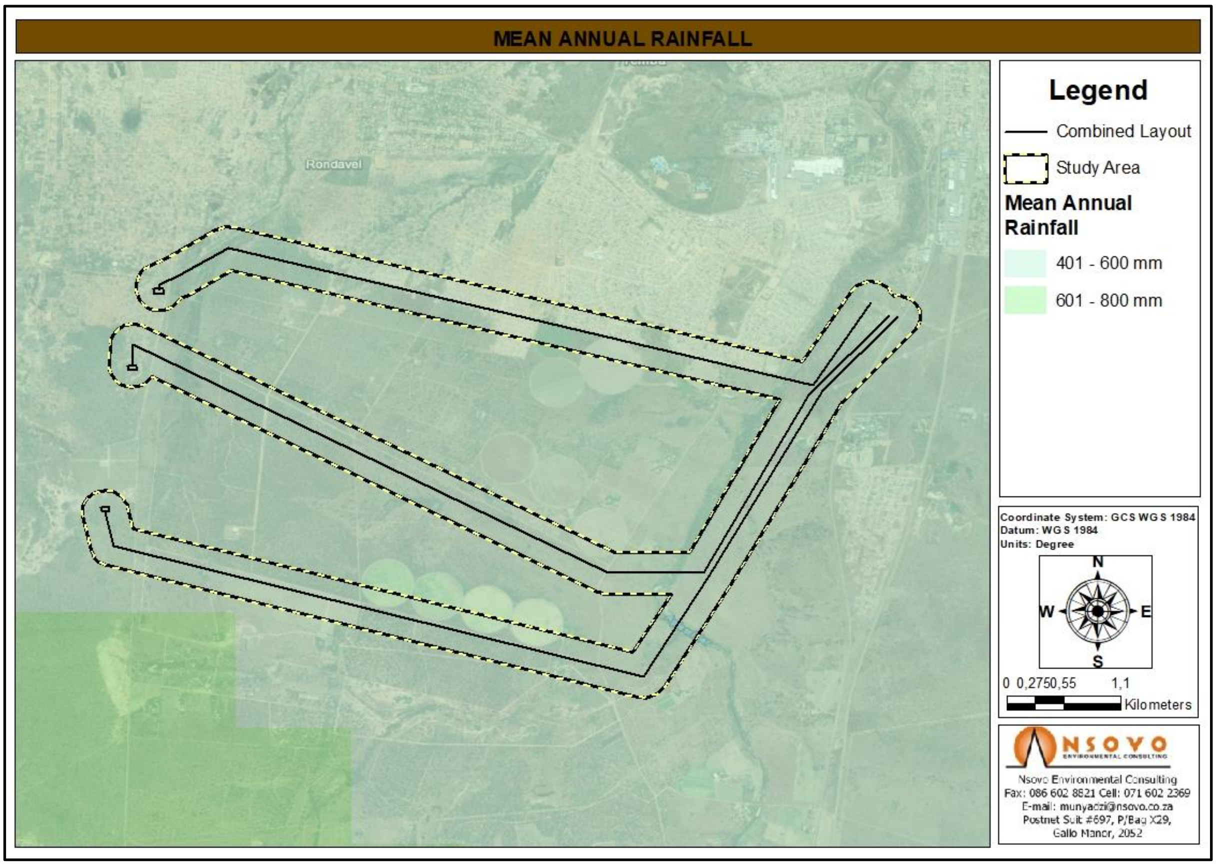

Figure 6: Mean Annual Rainfall associated with the study area.

3.2 Geology

The entire study area is underlain by the Beaufort Group rocks, typically predominantly mudstone, claystone, siltstone, sandstone, shale, and tuff-dominated. Figure 7 depicts the geological lithologies associated with the study area.

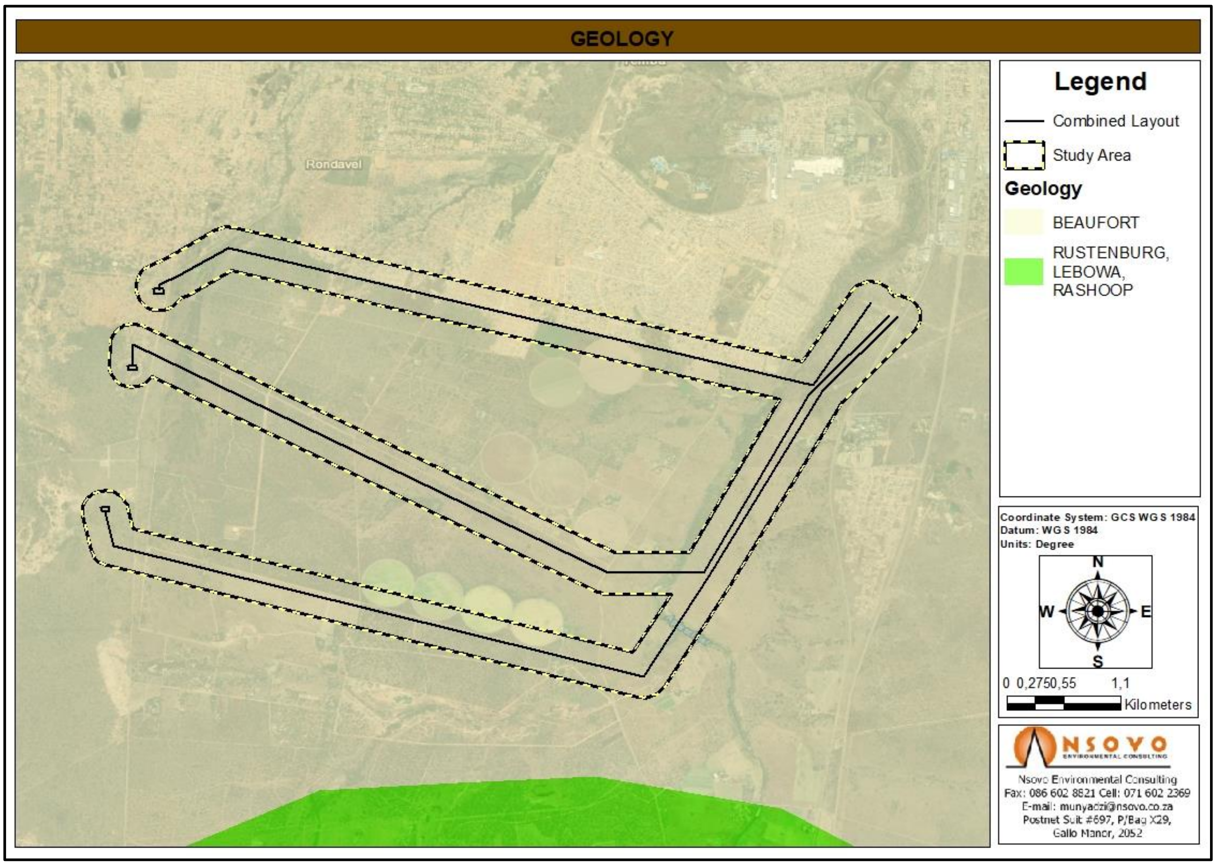

Figure 7: Geological formations associated with the study area.

3.3 Soil pH

The soil pH associated with the soils occurring within the Beestekraal and Atlanta Weirs ranges between 5.5 and 6.4, which is considered slightly acidic. The low pH can be attributed to other factors, which include but are not limited to;

- Parent material;
- Loss of organic matter;
- Removal of soil minerals when crops are harvested;
- Erosion of the surface layer; and
- Effects of nitrogen and sulphur fertilizers.

Some trace elements may become unavailable within this pH rang, but the pH is still optimum for many sensitive plants. However, these soils can be neutralised by the addition of lime. Figure 8 below depicts the soil pH associated with soils within the study area.

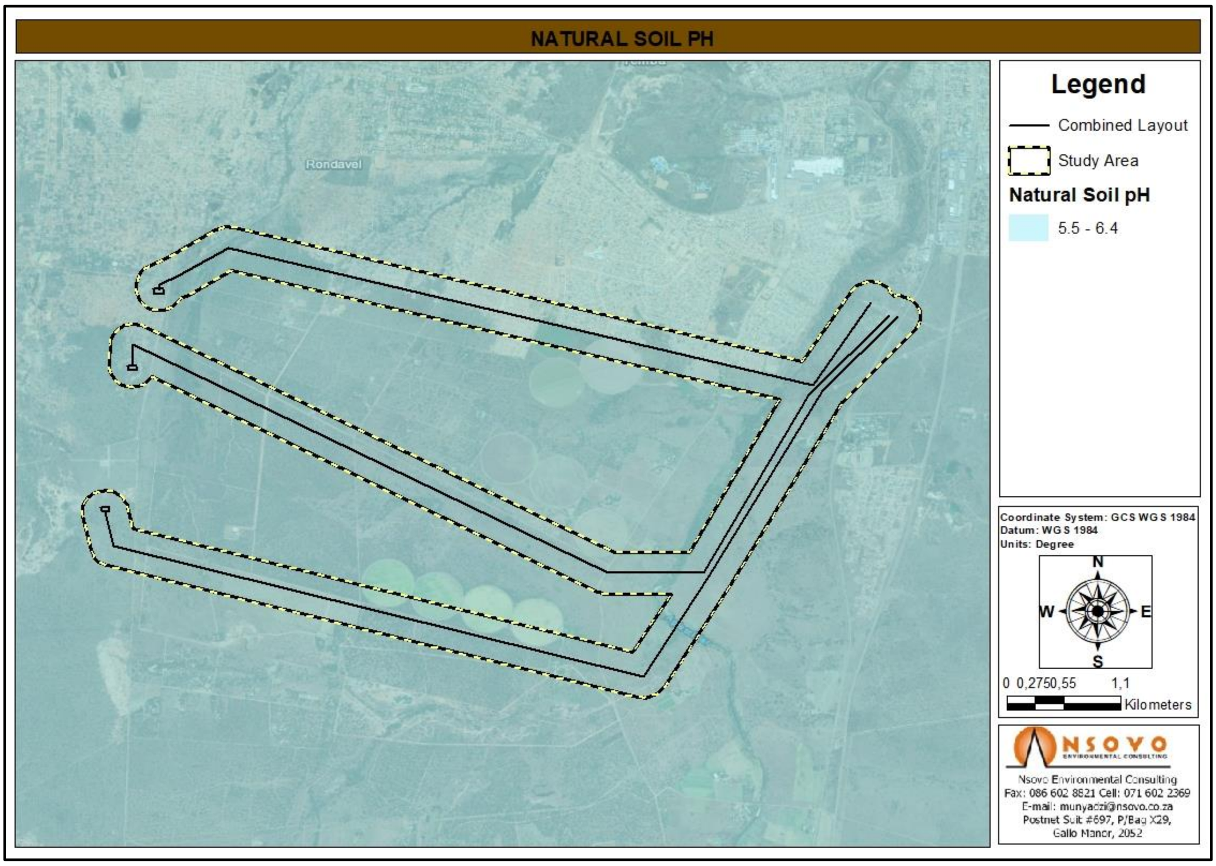

Figure 8: Soil pH associated with the project area.

3.5 Soil and Terrain (SOTER) Dominant Soils

The majority of the study area is characterised by Eutric Plinthosols. These soils are characterised by a marked textural differentiation between the top and subsoil horizons. The subsoil horizons are typically clay enriched compared to the sandier topsoil horizons because of clay illuviation, thus causing dense, firmly structured, and slowly permeable subsoil horizons. However, these soils can be cultivated due to the sandier topsoil and more fertile subsoil. The eastern portion of the study area is characterised by plinthic acrisols. These soils are typically highly weathered with a low base saturation, indicating they tend to be leached and low on nutrients. Thus, these soils are suitable for production under rain-fed and irrigated crops after liming and complete fertilization. Figure 9 below shows the SOTER soils associated with the study area.

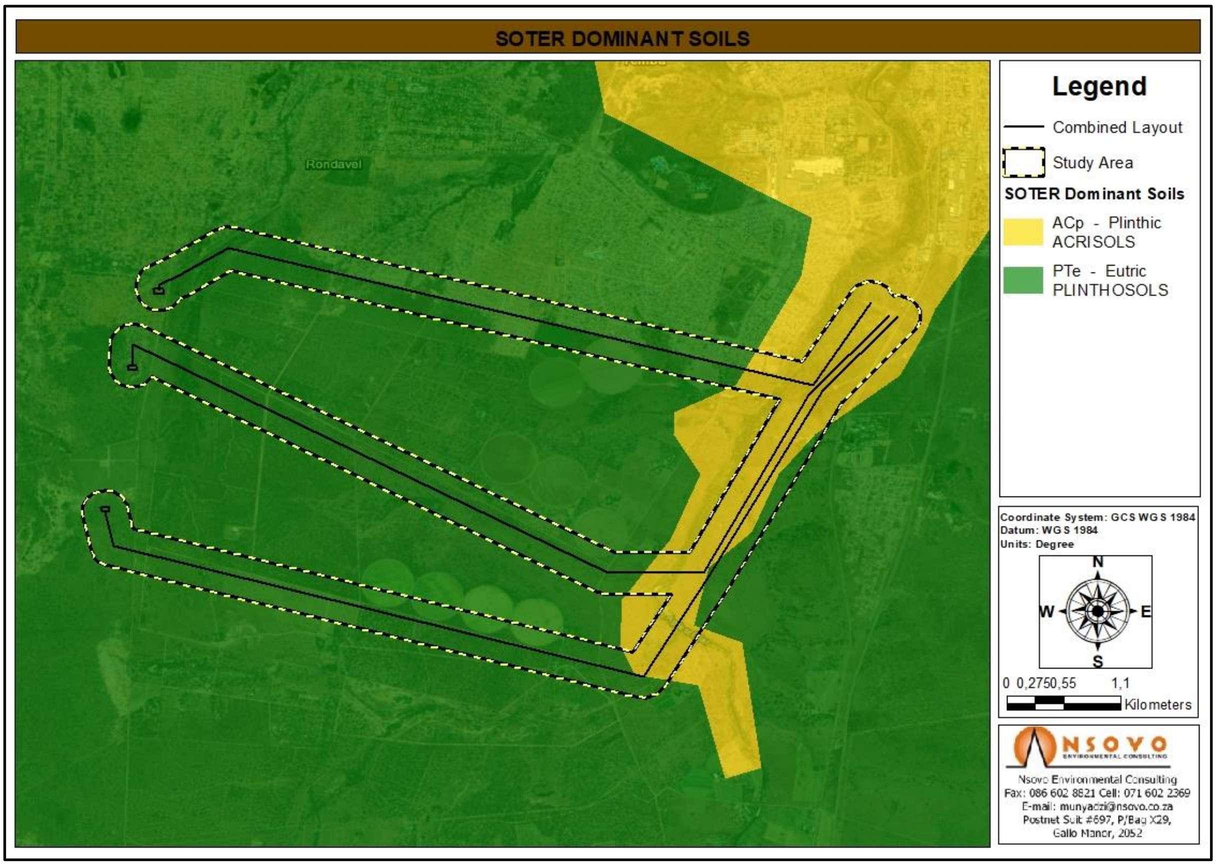

Figure 9: SOTER dominant soils associated with the study area.

3.6 Landtype Classes

Much of the study area is characterised by the Fa4 land type. The F landtypes are pedologically young and shallow or rocky soils with lime rare or absent in the landscape. These soils are typically shallow for any cultivation and thus left for light grazing and wilderness. However, to cultivate these soils, intensive management strategies will have to be employed. The Bb18 land type characterises the western portion of the study area. The B landtypes are typically plinthic landscapes with almost no upland duplex and margalistic soils. The moisture regime in these soils is often dominated by restricting rock and soil layers at depths that lead to the perching of water in localized water tables and lateral seepage zones and thus associated with freshwater systems at most.

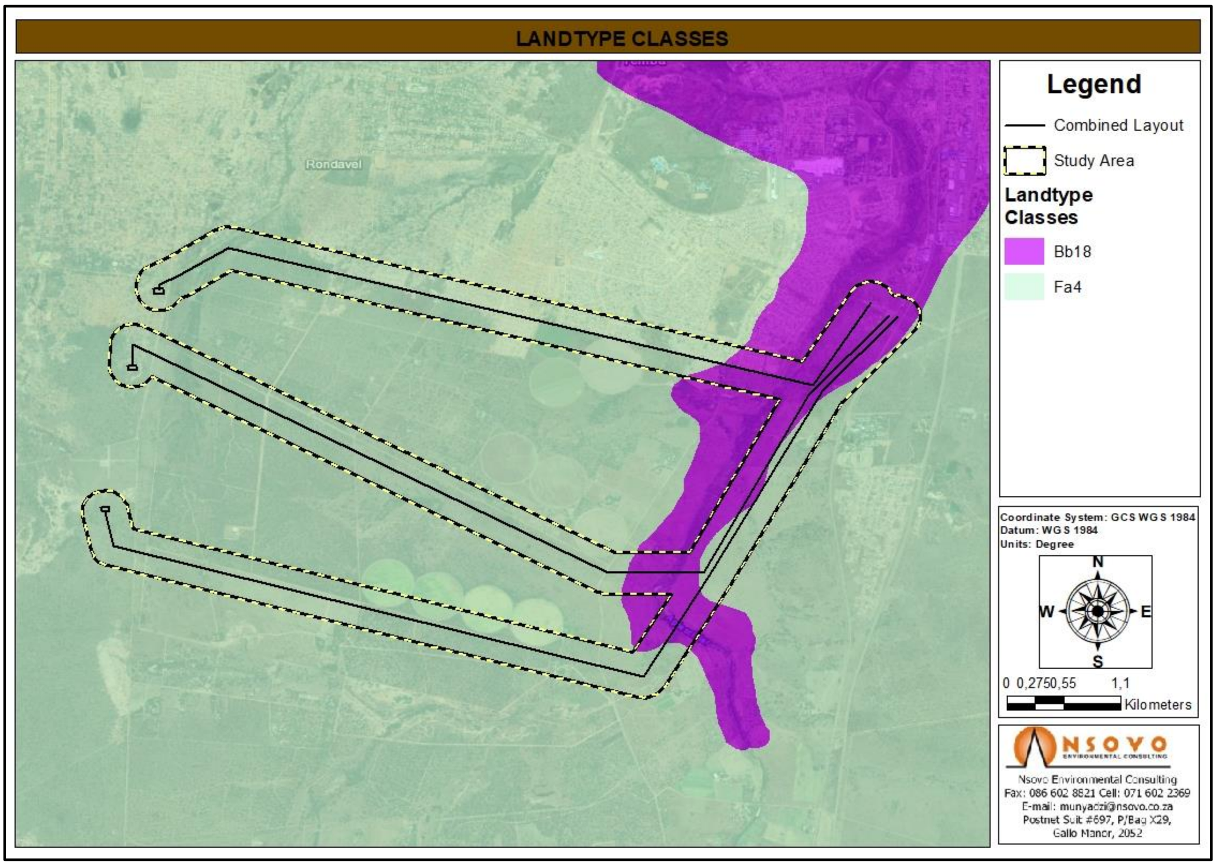

Figure 10: Landtype classes associated with the study area.

3.7 Desktop Land Capability

The soils associated with the entire study area have moderate arable potential (Class III). Figure 11 below shows the desktop land capability associated with the study area.

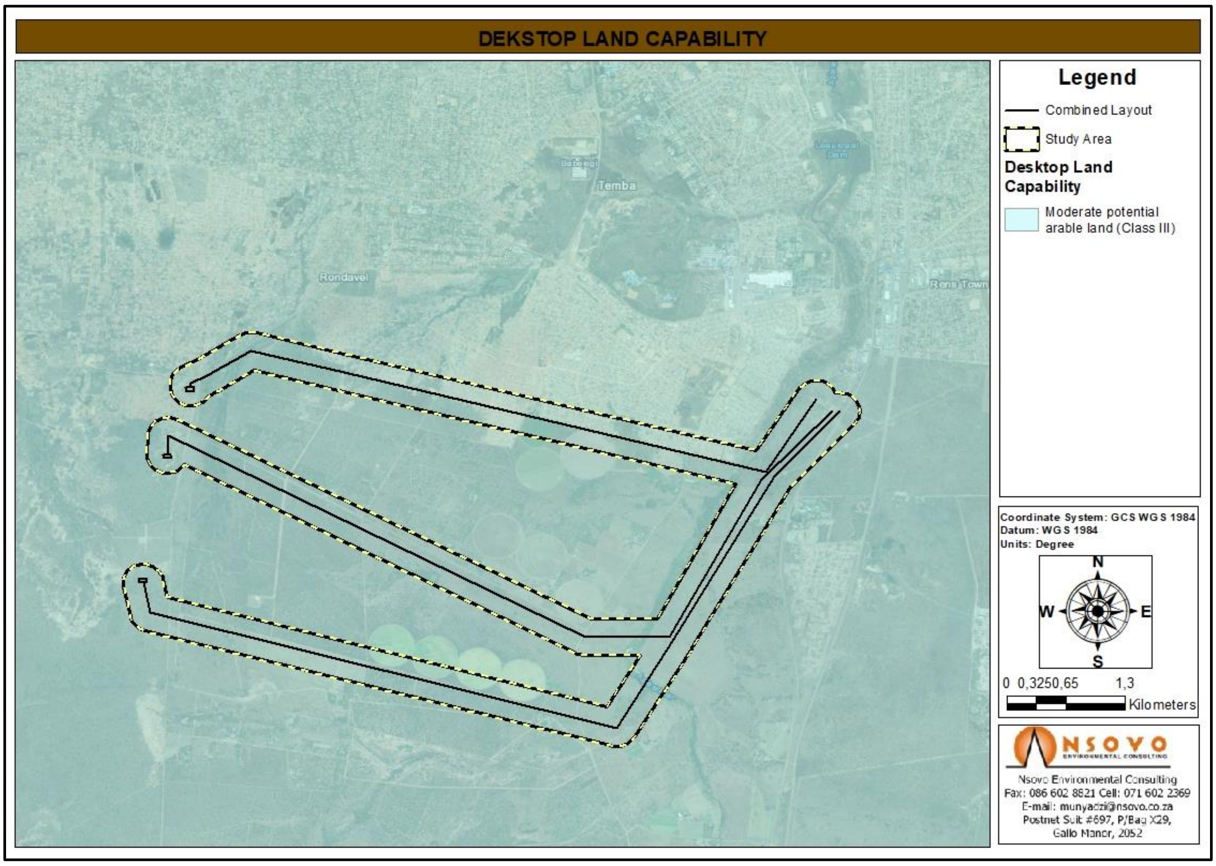

Figure 11: Desktop land capability associated with the study area.

4. FIELD VERIFIED RESULTS AND DISCUSSIONS

4.1 Land Uses within the Study Area

The immediate north of the study area is characterised by residential areas with mainly subsistence farming practices within the yards. The subsistence farming practices include vegetable production and livestock farming. The mid and south sections of the study area are characterised by large-scale farming enterprises cultivating soybeans under irrigation. Residential areas of commercial accommodation establishments (i.e., guest houses) were also observed. Minimal signs of soil degradation and soil erosion were observed, which can be attributed to previous excavations and the removal of trees to establish the informal settlements. Figure 12 below shows the identified land uses within the study area.

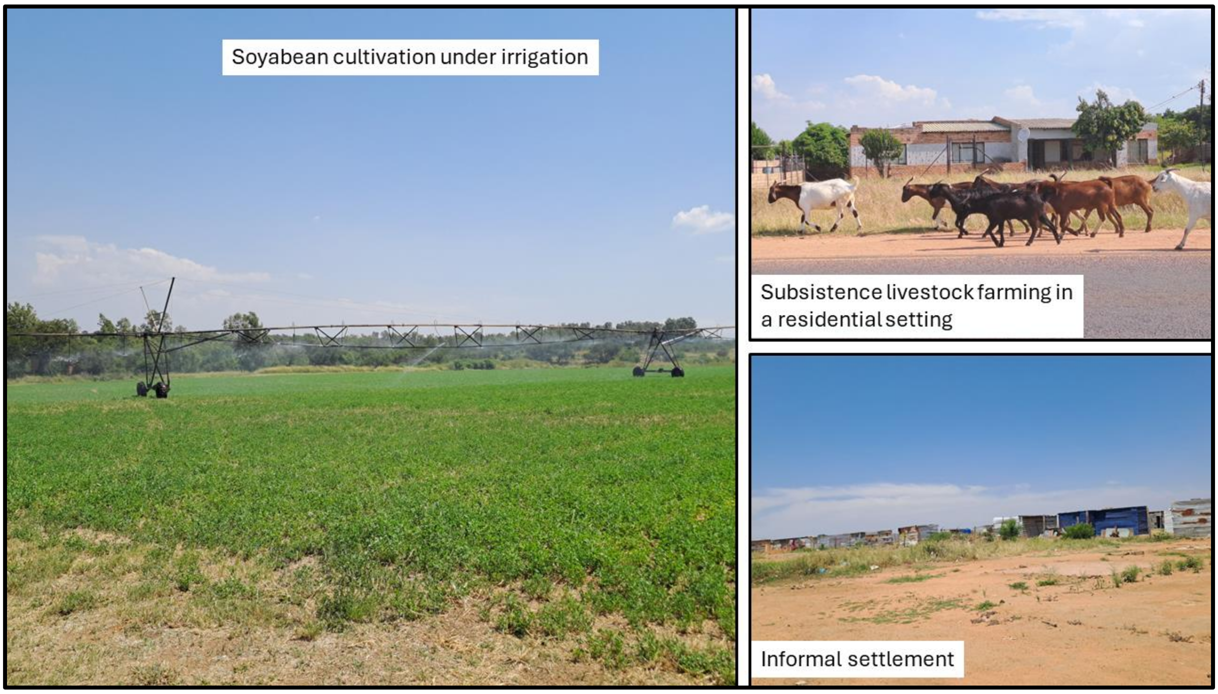

Figure 12: Land uses associated with the study area.

4.2 Soil Forms in the Study Area

The section below focuses on the identified soil forms within the study area. The spatial distribution of the identified soil forms within each study area is presented in Figures 17-19. The summary table depicting the area of coverage of each identified soil form is presented in Tables 4-6.

4.2.1 Mispah/Glenrosa

The Glenrosa soil form associated with the study area is of saprolithic character, which falls under the soil family Gs2110. The saprolithic Glenrosa is characterised by the presence of highly weathered material with a friable to hard consistence of the parent rock; in this instance the quartz material is highly resistant to weathering. The shallow depth of these soils can be attributed to limited rock weathering and convex topographical conditions at the crest or scarp of a hillslope, resulting in the removal of soil and, in some instances, leaving rocky outcrops behind. The 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 precludes cultivation.

Figure 13: View of the identified shallow Glenrosa soil forms.

4.2.2 Grabouw

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

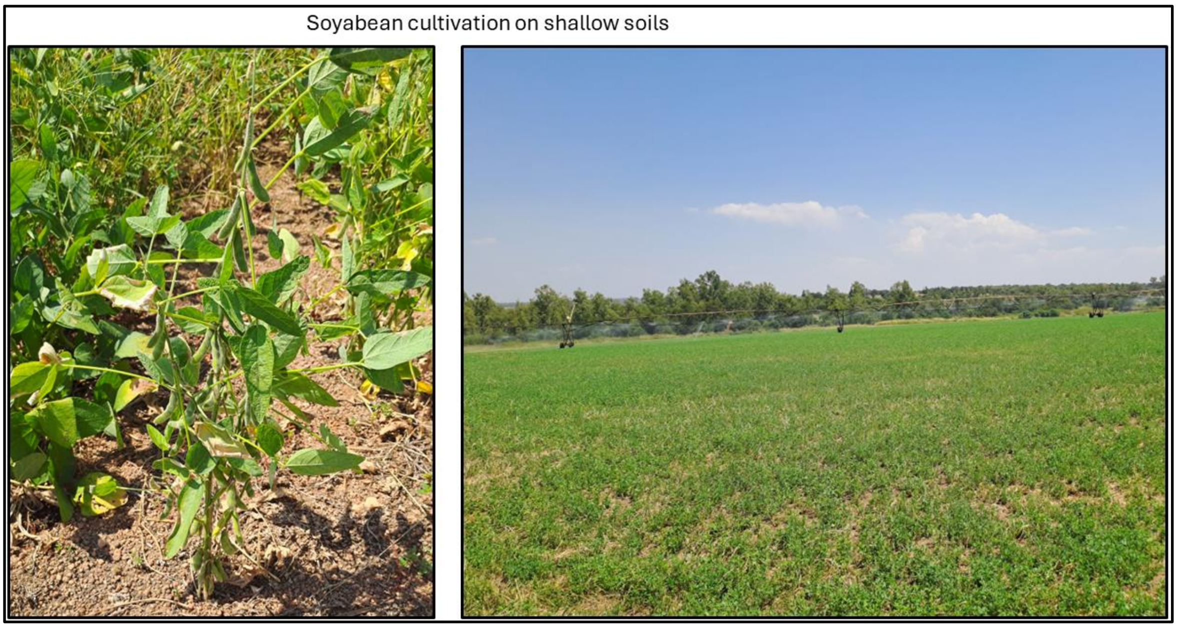

Figure 14: View of the identified Grabouw soil form.

4.2.3 Dundee and Gleylithic (Glenrosa)

The Dundee soil form is associated with watercourses but lacks evidence of gleying and consists of fluvial, lacustrine, or aeolian deposits. These soils typically occur on low-lying terrain positions. These soils are sandy and thus lack sufficient nutrients and are prone to waterlogging during the rainy season. The Glenrosa soil form is characterized by a gleylithic layer indicating prolonged saturation with water, which falls under the soil family Gs3130. These soils are shallow, with a stone line below the orthic horizon, and underlain by the lithic character, which has signatures of saturation. The soils are prone to waterlogging conditions and can thus make cultivation difficult due to the lack of aeration. No cultivation is feasible on these soils as they can be prone to waterlogging conditions. These soils are classified under the Wet-based soils (Class V) land capability class, and frequent waterlogging is their main limitation.

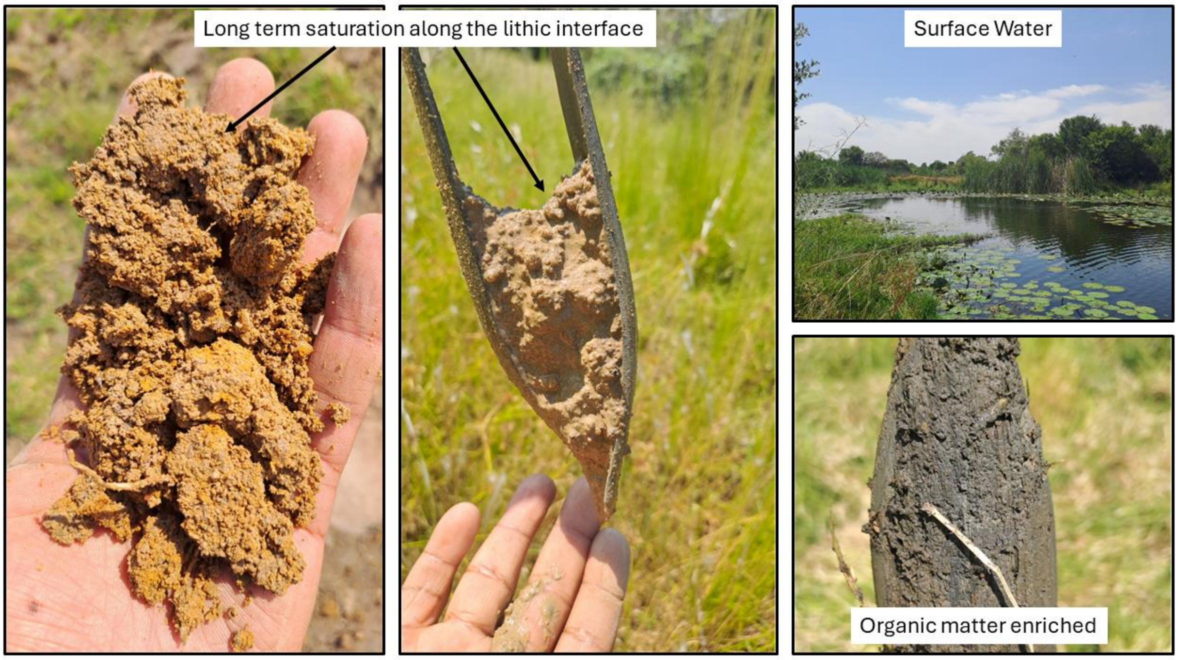

Figure 15: View of the identified Dundee and Gleylithic Glenrosa soil forms.

4.2.4 Witbank

These soils are usually disturbed by anthropogenic influences such as intentional transportation and severe physical disturbance. The diagnostic horizons are no longer arranged in any discernible order or recognizable horizonation as expected in natural soil, sometimes rendering them unsuitable for any cultivation.

Figure 16: Anthropogenically disturbed soils of the Witbank formation.

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

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	140.47	48.28	Grazing (Class VI)	Low	5. Low
Grabouw	19.02	6.53	Arable (Class IV)	Moderately High	9. Moderate to High
Dundee	3.84	1.32	Watercourse (Class V)	Very Low	3. Very Low to Low
Glenrosa (Gleylithic)	16.77	5.76			
Witbank	110.96	38.12	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	291.05	100			

Table 5: Soil forms in hectares (ha) within the Kekana Alternative 2 study area.

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	341.63	89.09	Grazing (Class VI)	Low	5. Low
Grabouw	19.97	5.21	Arable (Class IV)	Moderately High	9. Moderate to High
Dundee	13.83	3.61	Watercourse (Class V)	Very Low	3. Very Low to Low
Witbank	8.06	2.10	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	383.48	100			

Table 6: Soil forms in hectares (ha) within the Kekana Alternative 3 study area.

Preferred Alternative Study Area					
Soil Forms	Area (Ha)	Percentage (%)	Land Capability Class – According to (Smith, 2006)	Agricultural Potential	DAFF (2016) Classification
Glenrosa	344.92	95.99	Grazing (Class VI)	Low	5. Low
Dundee	13.23	3.68	Watercourse (Class V)	Very Low	3. Very Low to Low
Witbank	1.17	0.33	Wilderness (Class VIII)	Very Low	1. Very Low
Total Enclosed	359.32	100			

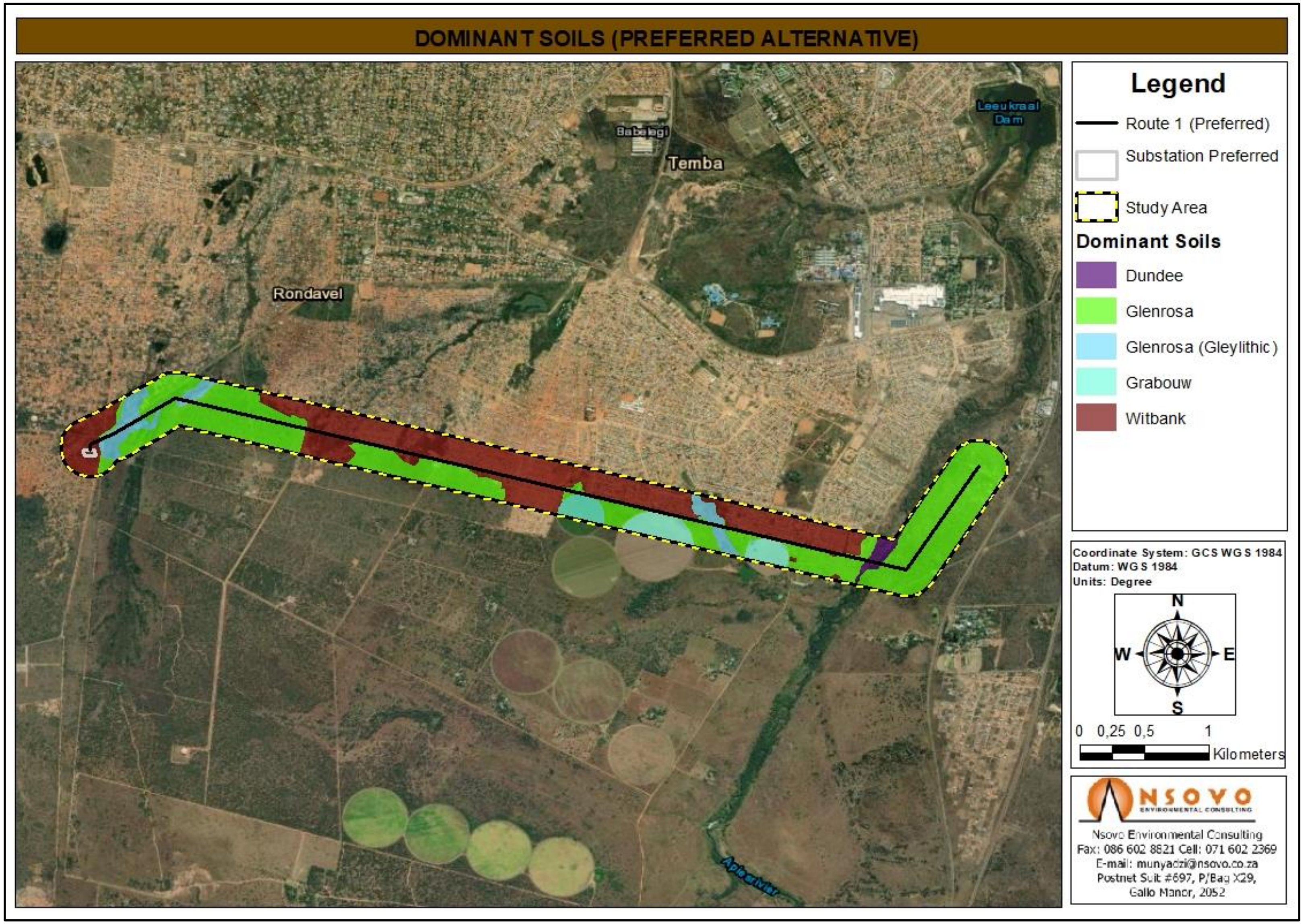

Figure 17: Dominant soils form within the preferred study area alternative.

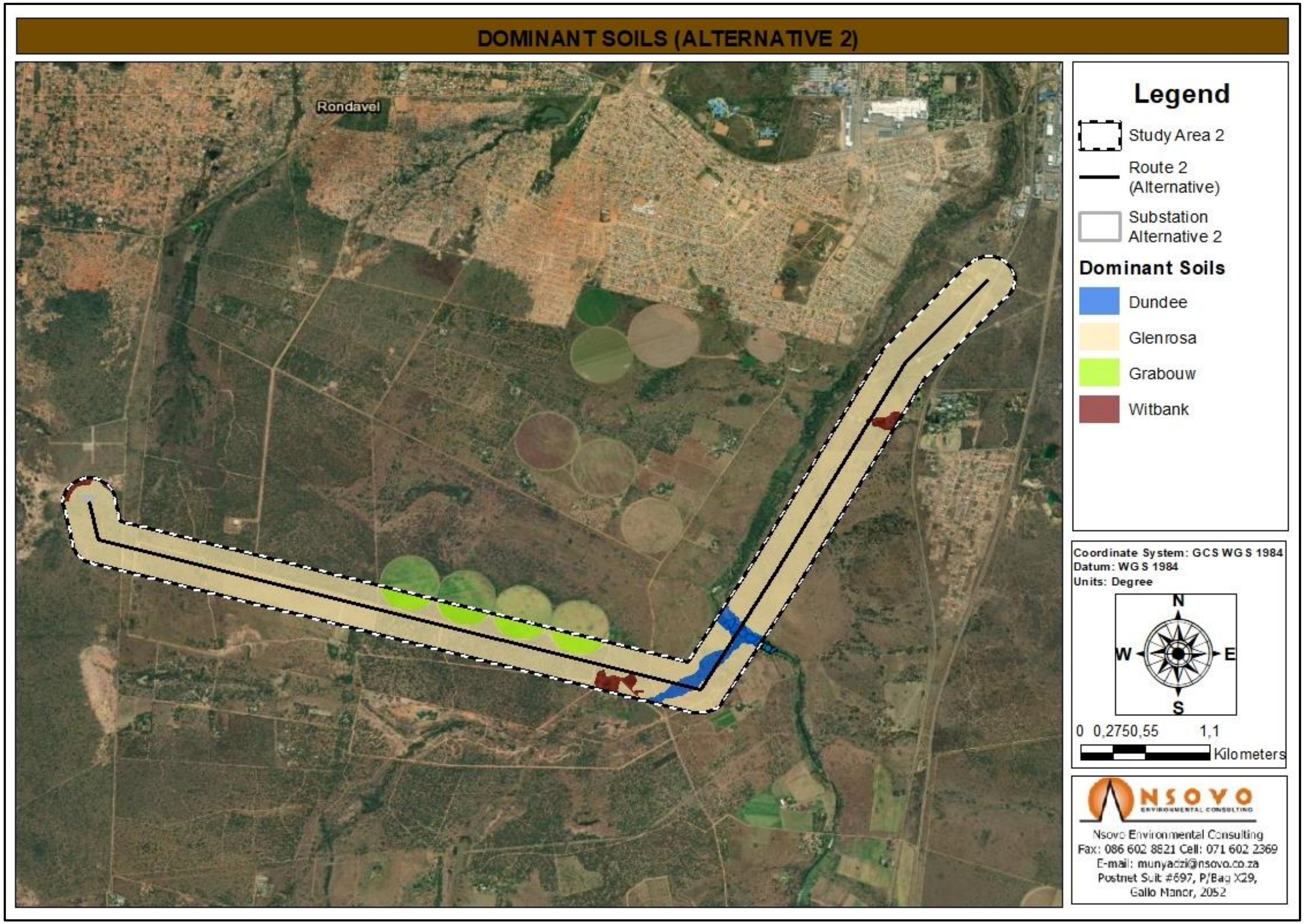

Figure 18: Dominant Soils associated with the Atlanta Weir study area.

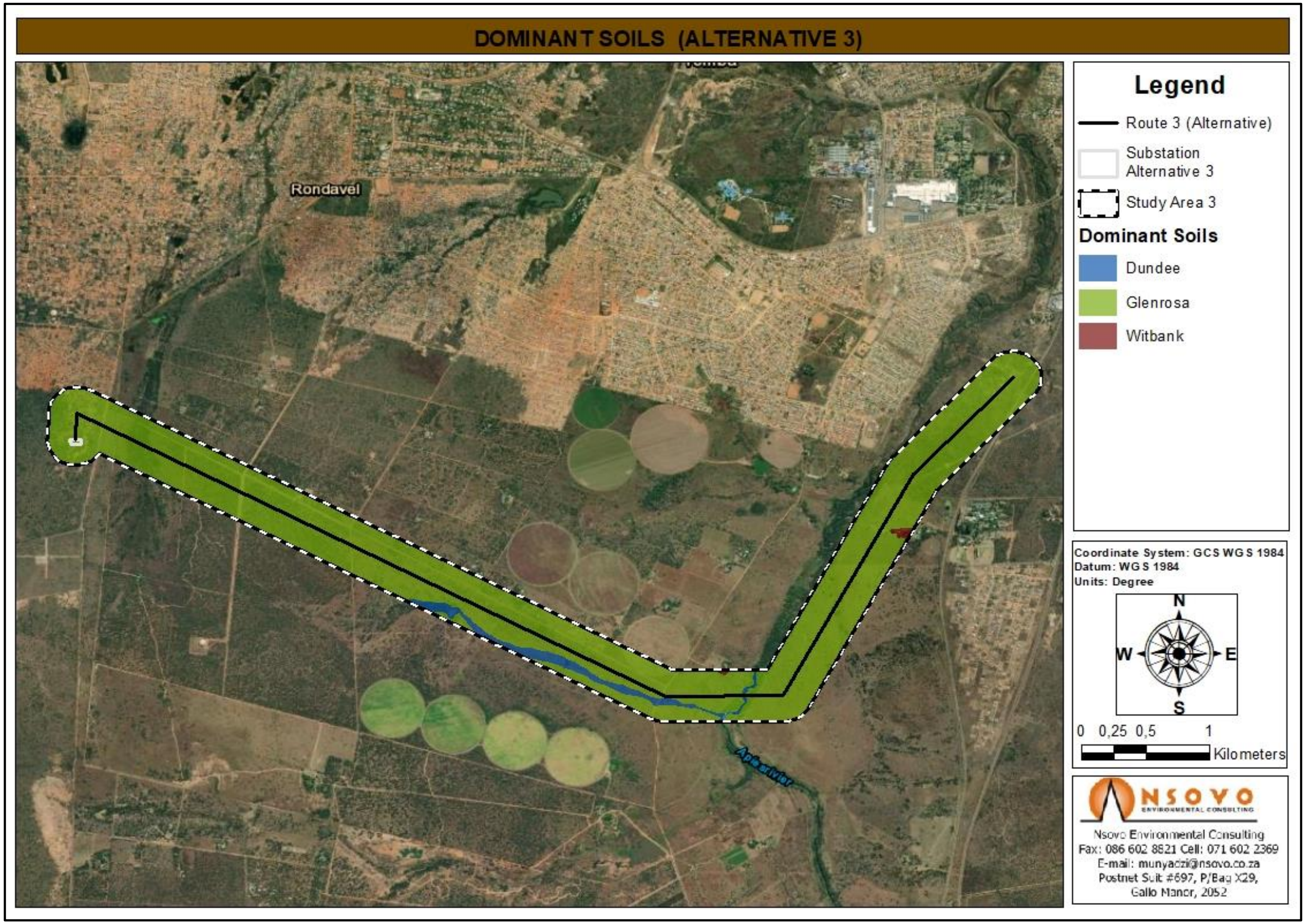

Figure 19: Dominant soils associated with the Paul Hugo Weir study area.

4.3 Land Capability and Agricultural Sensitivity

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. Figures 25-30 below depict the land capability and agricultural potential associated with the study area.

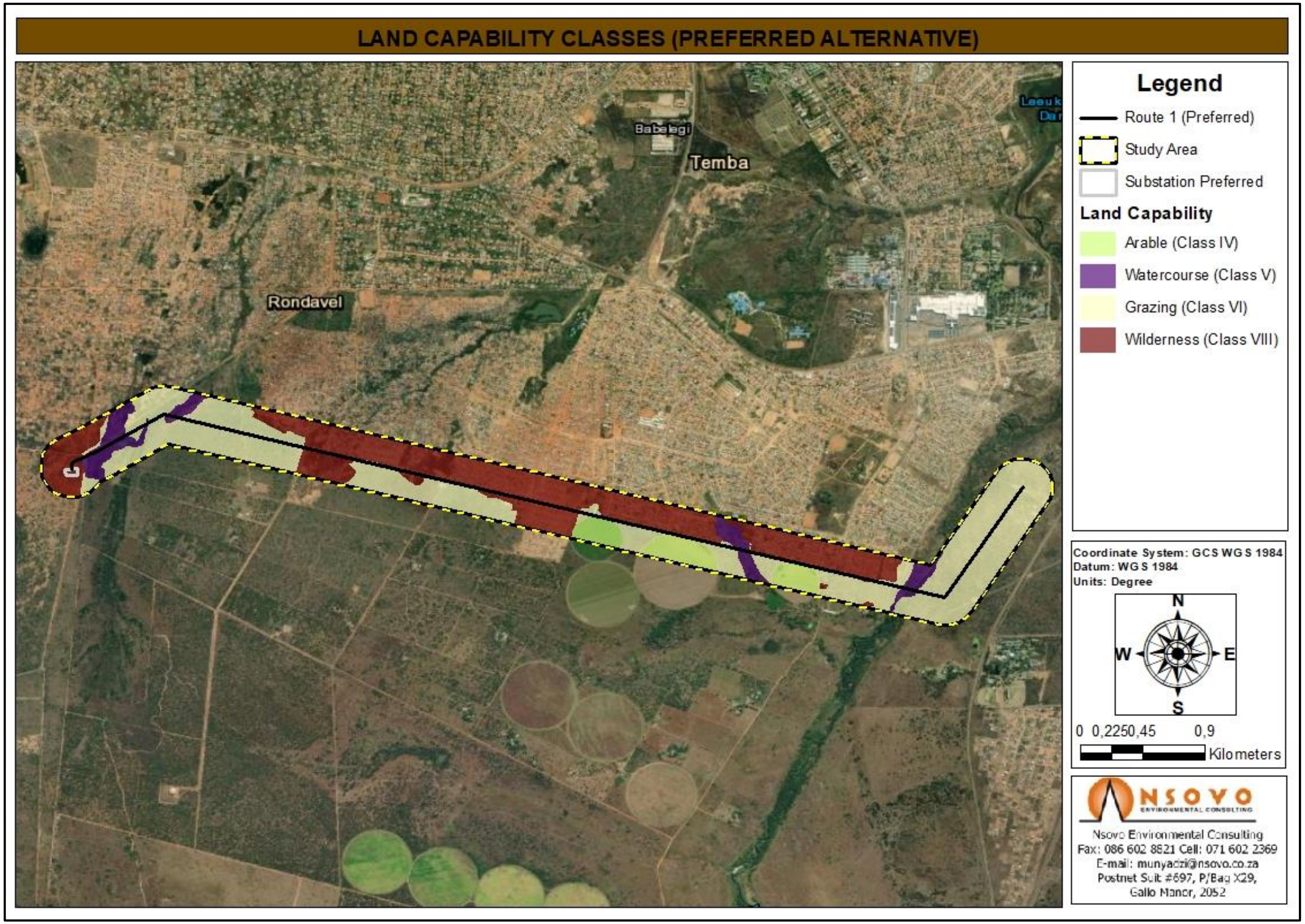

Figure 20: Map depicting land capability of soils within the preferred alternative study area.

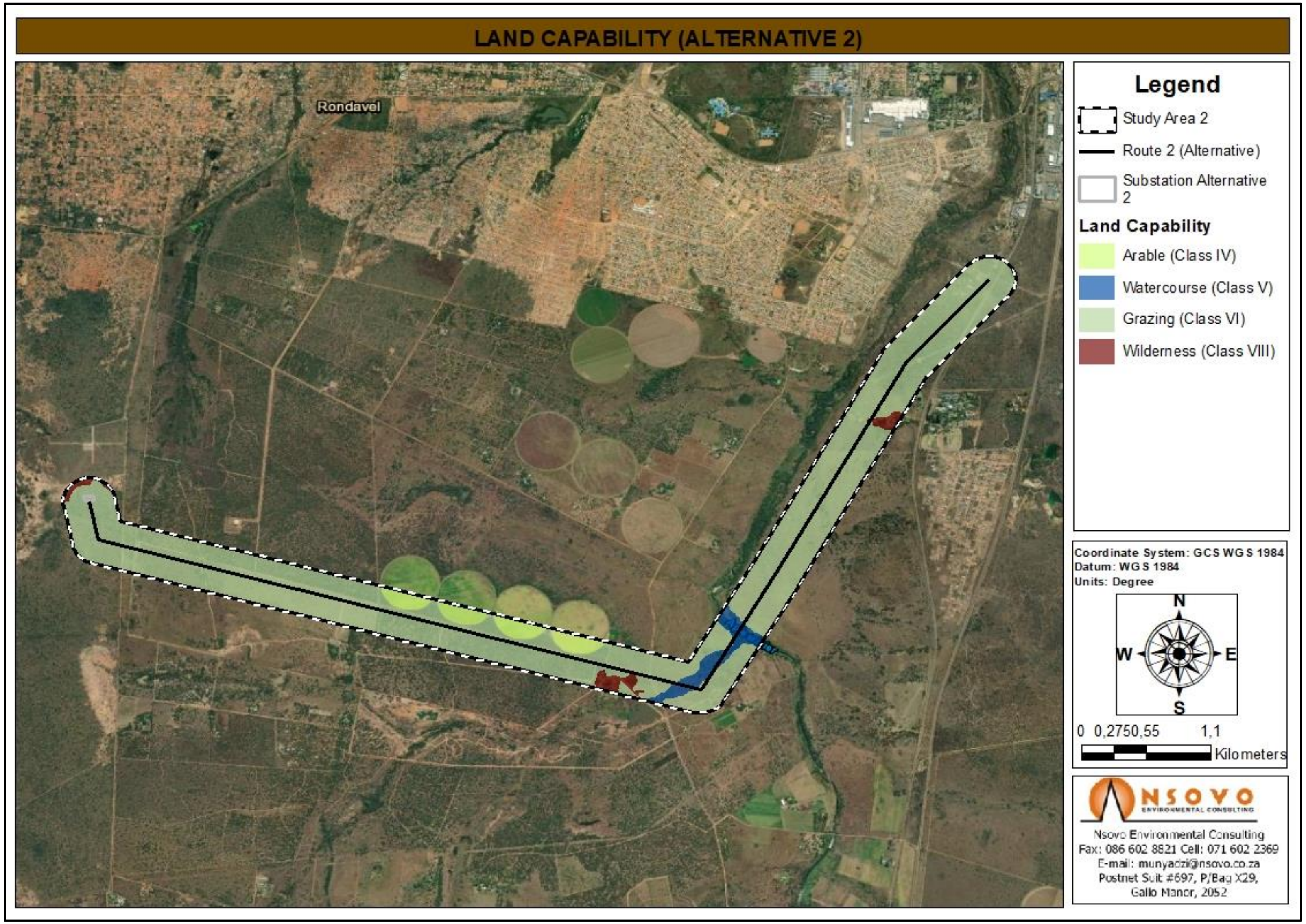

Figure 21: Land capability for soils associated with the alternative 2 study area.

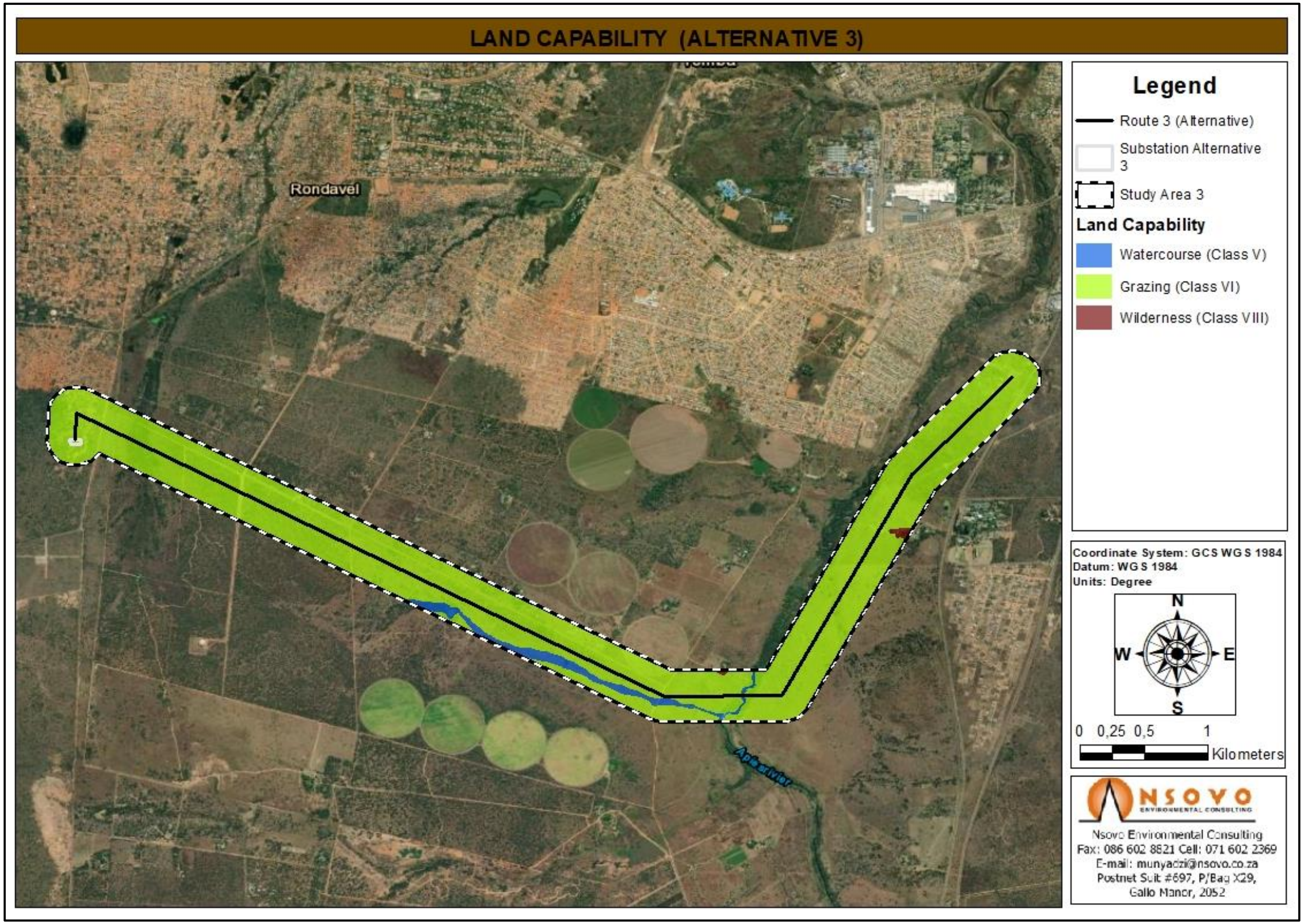

Figure 22: Land capability for soils associated with the alternative 3 study area.

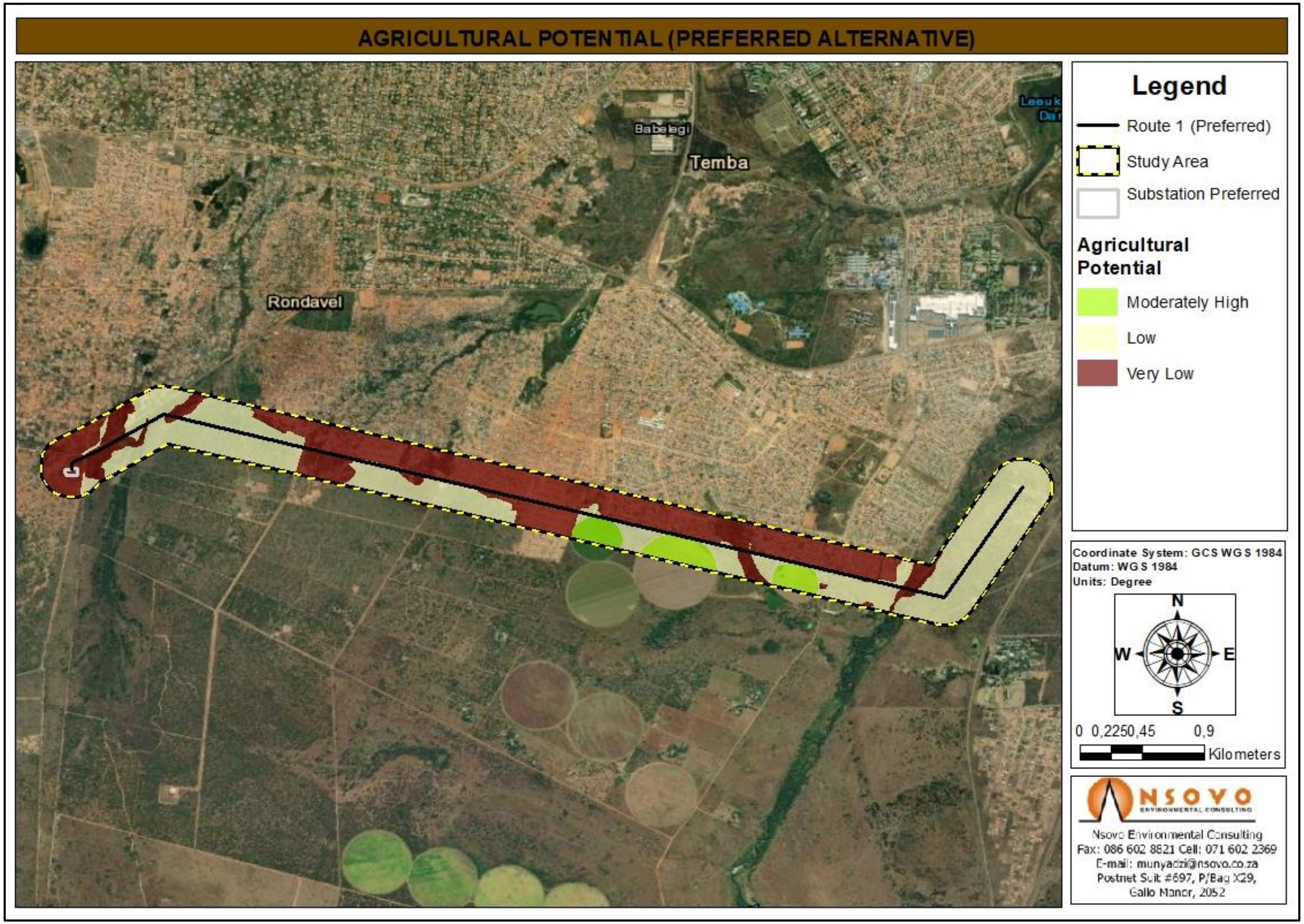

Figure 23: Agricultural potential for soils associated with the soils of the preferred alternative study area.

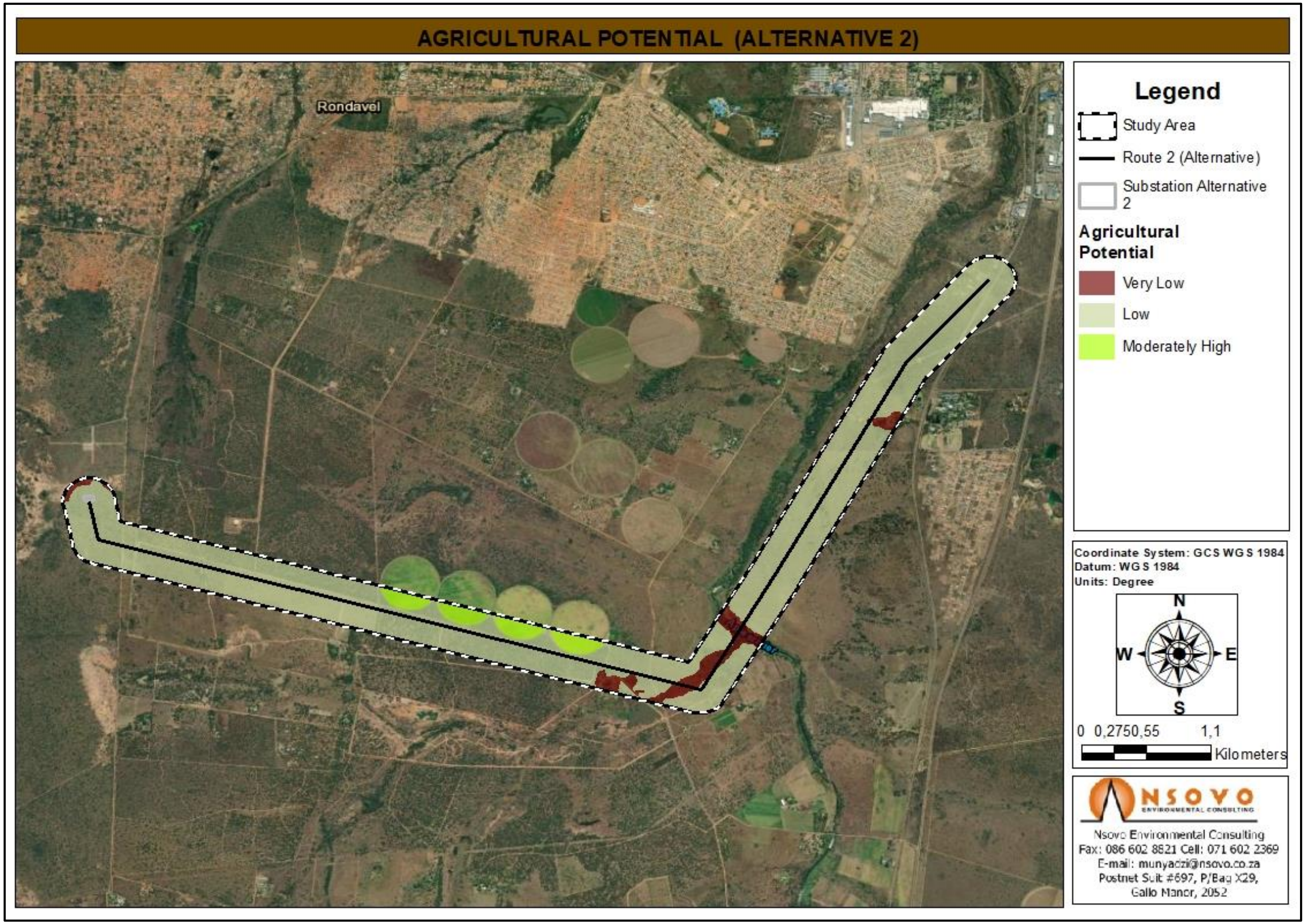

Figure 24: Agricultural potential for soils associated with the soils of the alternative 2 study area.

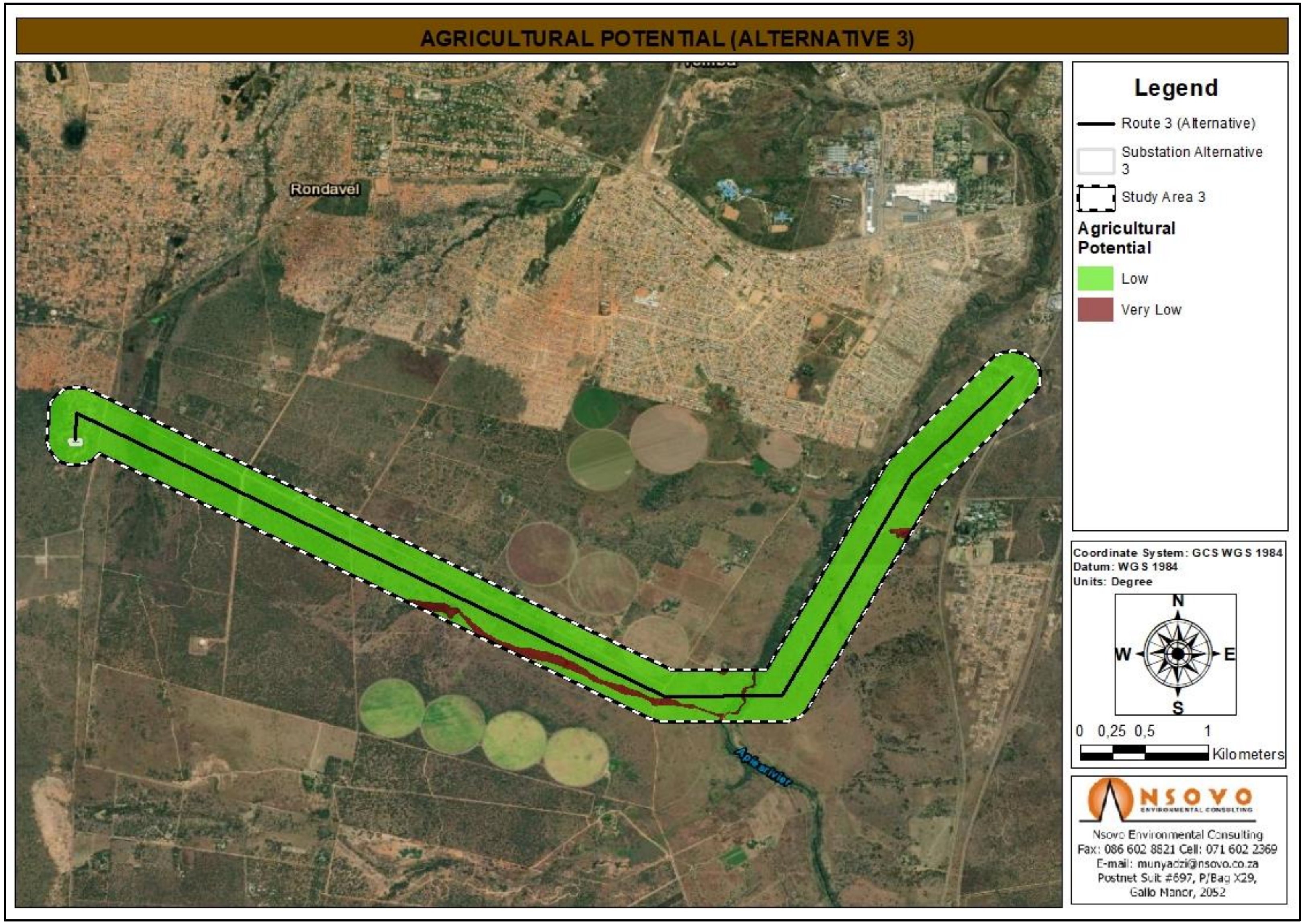

Figure 25: Agricultural potential for soils associated with the soils of the alternative 3 study area.

5. IMPACT ASSESSMENT

5.1 Assessment Methodology

According to the NEMA regulations (2014), all the 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 assessment of impacts is to identify and assess all the significant impacts that may arise due to the Proposed Development implementation and place the consequences of the Proposed Development before the competent authority.

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

The assignment of significance ratings has been undertaken based on the specialist team's experience and research. Subsequently, mitigation measures have been identified and considered for each impact. The assessment is repeated to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented). Each of the above impact factors has been used to assess each potential impact using ranking scales as detailed in Appendix B.

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

5.2 Impact Assessment Per Project Phase

Considering each powerline and associated power station's land capabilities, the occurring soils, and potential impacts, the impact ratings for each site were rated collectively because of the similar environmental setting.

5.2.1 Pre-Construction Phase

During the pre-construction phase of the proposed development, potential planning may lead to unnecessary clearing in areas not demarcated to be part of the footprint areas and areas wherein cultivation is taking place. The main envisaged activities include the following:

- Potential poor planning leading to the placement of waste management sites and infrastructure on highly sensitive soils under cultivation;
- Vegetation clearing and partial topsoil stripping are part of surface preparation; thus, potential poor planning could lead to the placement of stripped and stockpiled soils outside the demarcated areas.

The disturbance of original soil profiles and horizon sequences of these profiles during the preparation phase may lead to a deterioration of soils in terms of erosion 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 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 caused by heavy vehicles commuting on the existing roads and any newly constructed access road to increase access to the substations. Without mitigation measures, the impacts will be localised within the site boundary with medium consequence and significance.

5.2.2 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 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 appropriately mitigated;
- 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 the handling and storing building materials and different kinds of waste. This will potentially result in soil pollution when not managed properly.

The disturbance of original soil profiles and horizon sequences of these profiles during earthworks is considered a measurable deterioration in terms of erosion. 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 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 caused by heavy vehicles commuting on the existing roads and any newly constructed access road to increase access to the substations. Without mitigation measures, the impacts will be localised within the site boundary with medium consequence and significance.

5.2.3 Operational Phase

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

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

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

The disturbance of original soil profiles and horizon sequences of these profiles is considered a measurable deterioration, leading to soil erosion. This impact is supposed to be 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 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 caused by vehicle movement on soil surfaces (including access roads). If not mitigated properly, this reversible impact over time will be localised within the site boundary and have medium consequence and significance.

The change in land use will result in the loss of the current land capability and land use, as the current agricultural practices will cease for the duration of the proposed development.

5.2.4 Closure and Decommissioning Phase

Decommissioning can be considered the reverse of the construction phase, with the demolition and removal of the 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:

- Transporting materials away from the site will compact the soil of the existing roads, and fuel and oil spills from vehicles may result in soil chemical pollution.

- Earthworks will redistribute inert waste materials to fill the ponds and ditches and add topsoil to the soil surface. These activities will not further impact land use and capability but may increase soil compaction.
- Other activities in this phase that will impact soil are handling and storing materials and different kinds of waste generated and accidental spills and leaks with decommissioning activities. When not managed properly, these activities can potentially result in soil pollution.

5.3 Impact Summary Tables

Tables 7 to 10 below present the impact summary tables for the loss of land capability, soil erosion, soil compaction, and soil contamination associated with the powerlines. Tables 11 to 14 show the summary tables for the proposed substation.

5.3.1 Powerline servitudes Impact Ratings

Table 7: Rating of impacts for the loss of land capability and associated mitigation measures for the overhead powerline servitudes.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Clearing vegetation and levelling soils where necessary, such as removing topsoil material to create the foundation for installing electrical pylons, and temporary laydown areas potentially encroaching on grazing and cultivated areas.							
WOM		Neg	3	2	8	4	52
WM		Neg	2	1	6	3	27
Mitigation Measures							
The project operations must be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
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 powerlines facilities to avoid soil loss and contamination.							
The proposed development within the study area should aim to minimise the impact on soils with used for cultivation and grazing activities.							
Operational and Maintenance Phase							
Operation and maintenance of the overhead powerlines; constant traffic and frequent soil disturbances resulting in land capability loss.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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.							
Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion.							
Use geotextiles and contours to prevent soil erosion and revegetate exposed soil surfaces where possible.							
Decommissioning Phase							
Potential future decommissioning activities will likely involve dismantling and removal of the powerline servitudes 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 landfilled 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, any decompacted, and any excavations backfilled with soils to restore the site for future use.							

Table 8: Rating of impacts on soil erosion and associated mitigation measures for the overhead powerline servitudes.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Potential frequent movement of earth moving machinery within lose and exposed soils, leading to excessive erosion. Site clearing, removal of vegetation, and associated disturbances to soils, leading to increased runoff, erosion, and consequent loss of land capability in cleared areas and subsequent loss of soils utilised for grazing and cultivation.							
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.							
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.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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							
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 erosion.							
No Corrective Measures		Neg	2	2	6	3	30
Corrective Measures		Neg	1	1	4	3	18
Mitigation Measures							

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

Table 9: Rating of impacts on soil compaction and associated mitigation measures for the overhead powerline servitudes.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Site clearing, removal of vegetation, and associated disturbances to soils, leading to, increased runoff, soil compaction and consequent loss of land capability in cleared 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.							
Unnecessary trafficking and movement over the areas targeted for construction must be avoided, especially heavy machinery							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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 with the existing road as much 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							
Potential future decommissioning activities will likely involve dismantling and removal of the power plant and other on-site buildings, equipment, and facilities. During this period, there will be heavy vehicular traffic and thus increasing the likelihood of soil compaction.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
No Corrective Measures		Neg	2	2	6	3	30
Corrective Measures		Neg	1	1	4	3	18
Mitigation Measures							
The study area should be revegetated with indigenous vegetation to help with soil compaction, runoff, erosion and dust control as required or returned to agricultural use.							
Establish natural drainage patterns as pre-construction through recontouring, revegetation, and ripping soils to alleviate soil compaction.							
Dismantled equipment should be recycled, and non-recyclable material should be appropriately landfilled by an approved service provider.							
Any portions of the site with compacted soil should be de-compacted and any excavations backfilled with soils to restore the site for future use.							

Table 10: Rating of impacts on soil contamination and associated mitigation measures for the contamination

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Spillage of petroleum hydrocarbons during construction of the proposed overhead powerline and substation and the associated access road. Potential disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.							
WOM		Neg	3	2	8	5	65
WM		Neg	2	1	6	4	36

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Mitigation Measures							
The project operations must be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
Ensure proper handling and storage of hazardous chemicals and materials (e.g., fuel, oil, cement, concrete, reagents, etc.) as per their corresponding Safety Data Sheets.							
Maintenance of vehicles and equipment should be carried out in designated appropriate facilities fitted with spillage containment, floors, and sumps to capture any fugitive oils and greases.							
Implementing regular site inspections for materials handling and storage.							
Development of detailed procedures for spill containment and soil clean up.							
Operational and Maintenance Phase							
Operation and maintenance of the overhead powerline servitudes; constant traffic and frequent soil disturbances resulting in land capability loss.							
No Corrective Measures		Neg	2	4	6	3	36
Corrective Measures		Neg	1	4	4	3	27
Mitigation Measures							
Maintenance vehicles should be checked for leakages of hydrocarbons before commencement of maintenance activities.							
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.							
Decommissioning Phase							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Potential future decommissioning activities will likely involve dismantling and removal of the powerline servitude, 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 soil compaction, runoff, 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, any decompacted, and any excavations backfilled with soils to restore the site for future use.							

5.3.2 Substations Impact Ratings

Table 11: Rating of impacts for the loss of land capability and associated mitigation measures for the substation alternatives.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Clearing vegetation and levelling soils where necessary, such as removing topsoil material to create the foundation for constructing the proposed substations, and temporary laydown areas. Road upgrades and maintenance potentially encroaching on grazing and cultivated areas.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
WOM		Neg	3	2	6	4	44
WM		Neg	2	1	4	3	21
Mitigation Measures							
The project operations must be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
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.							
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 substations; constant traffic and frequent soil disturbances resulting in land capability loss.							
No Corrective Measures		Neg	2	4	6	3	36
Corrective Measures		Neg	1	4	4	2	18
Mitigation Measures							
Maintenance vehicles should be checked for leakages of hydrocarbons before commencement of maintenance activities.							
The solar panels should be cleaned with clean water, and the use of chemicals should be avoided to minimise the likelihood of potential soil contamination.							
Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Use geotextiles and contours to prevent soil erosion and revegetate exposed soil surfaces where possible.							
Decommissioning Phase							
Potential future decommissioning activities will likely involve dismantling and removal of the substations, 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.							
Any portions of the site with compacted soil should be, any decompacted, and any excavations backfilled with soils to restore the site for future use.							

Table 12: Rating of impacts on soil erosion and associated mitigation measures for the substations.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Clearing vegetation and levelling soils where necessary, such as removing topsoil material to create the foundation for constructing the substations, and temporary laydown areas. Road upgrades and maintenance potentially encroach on cultivated areas and increase the likelihood of soil erosion.							
WOM		Neg	3	2	5	4	40
WM		Neg	2	1	4	3	21
Mitigation Measures							
The project operations must be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
No site-clearing activities should take place during periods of heavy rainfall.							
Access roads should be sloped at a lower gradient. Access roads should be inclined at a lower gradient to reduce runoff-induced erosion.							
Use geotextiles and contours to control soil erosion and revegetate exposed soil surfaces where possible.							
Consideration needs to be given to the use of water for dust suppression– the use of binding agents like molasses should be considered for unsealed roads and dust suppression.							
Always strip a suitable time before the placement or construction of the substations 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 substations; constant traffic and frequent capability soil; soil disturbances resulting in land capability loss.							

<table>
<tr><th rowspan="2">Issue</th><th rowspan="2">Corrective measures</th><th colspan="5">Impact rating criteria</th><th rowspan="2">Significance</th></tr>
<tr><th>Nature</th><th>Extent</th><th>Duration</th><th>Magnitude</th><th>Probability</th></tr>
<tr><td colspan="2">No Corrective Measures</td><td>Neg</td><td>2</td><td>4</td><td>6</td><td>4</td><td>48</td></tr>
<tr><td colspan="2">Corrective Measures</td><td>Neg</td><td>1</td><td>4</td><td>4</td><td>3</td><td>27</td></tr>
<tr><td colspan="8">Mitigation Measures</td></tr>
<tr><td colspan="8">Maintenance vehicles should be checked for leakages of hydrocarbons before the commencement of maintenance activities.</td></tr>
<tr><td colspan="8">Disturbed areas adjacent to the footprint should be revegetated with indigenous grass mix to limit potential soil erosion.</td></tr>
<tr><td colspan="8">Use geotextiles and contours to prevent soil erosion and revegetate exposed soil surfaces where possible.</td></tr>
<tr><td colspan="8">Decommissioning Phase</td></tr>
<tr><td colspan="8">Potential future decommissioning activities will likely involve dismantling and substations 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)</td></tr>
<tr><td colspan="2">No Corrective Measures</td><td>Neg</td><td>2</td><td>2</td><td>6</td><td>3</td><td>30</td></tr>
<tr><td colspan="2">Corrective Measures</td><td>Neg</td><td>1</td><td>1</td><td>4</td><td>3</td><td>18</td></tr>
<tr><td colspan="8">Mitigation Measures</td></tr>
<tr><td colspan="8">The study area should be revegetated with indigenous vegetation to help with erosion and dust control as required or returned to agricultural use.</td></tr>
<tr><td colspan="8">Establish natural drainage patterns as pre-construction through recontouring and revegetation.</td></tr>
<tr><td colspan="8">Dismantled equipment should be recycled, and non-recyclable material should be appropriately land filled by an approved service provider.</td></tr>
</table>

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 soils to restore the site for future use.							

Table 13: Rating of impacts on soil compaction and associated mitigation measures for all the substations.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Heavy vehicle traffic within and around the study area and potentially compacting the soil during the construction of the substations and temporary laydown areas.							
WOM		Neg	2	2	6	4	40
WM		Neg	2	1	4	3	21
Mitigation Measures							
The project operations be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
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.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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 substations; 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							
Potential future decommissioning activities will likely involve dismantling and removal of the substations and other on-site buildings, equipment, and facilities. During this period, there will be heavy vehicular traffic and thus increasing the likelihood of soil compaction.							
No Corrective Measures		Neg	2	2	6	3	30
Corrective Measures		Neg	1	1	4	3	18
Mitigation Measures							

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

Table 14: Rating of impacts on soil contamination and associated mitigation measures for the substations.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Pre-Construction and Construction Phase:							
Leaching of hydrocarbons chemicals into the soils from maintenance equipment, substations leading to alteration of the soil chemical status as well as contamination of ground water. Potential disposal of hazardous and non-hazardous waste, including waste material spills and refuse deposits into the soil.							
WOM		Neg	2	2	6	4	40
WM		Neg	2	1	4	4	28
Mitigation Measures							
The project operations be kept within the demarcated footprint areas as far as practically possible to minimise edge effects.							
Ensure proper handling and storage of hazardous chemicals and materials (e.g. fuel, oil, cement, concrete, reagents, etc.) as per their corresponding Safety Data Sheets.							

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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 spills containment and soils clean up.							
Operational and Maintenance Phase							
Direct chemical spills on soils from the substations, 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.							
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	4	40

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
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 Cumulative Impacts and Screening tool verification

The identified development footprint areas (preferred, alternative 2 and 3) present areas largely characterised by shallow soils (Mispah/Glenrosa), followed by soils intentionally altered to favour agricultural cultivation (Grabouw), soils with wetness characteristics (Dundee and Gleylithic Glenrosa) lastly, disturbed areas due to human activities in the form of earthworks (Witbank), and areas of active cultivation were observed outside the development footprint areas. Therefore, most soils identified within the study area are largely unsuitable for agricultural cultivation due to their inherent soil properties, unless intense management strategies are utilised (such as deep in-situ ripping of the lithic layer below the top soil.

The agricultural practices within the study area include soybean cultivation (as identified during the site visit), which utilises the centre pivot irrigation techniques, producing high-value crops. Furthermore, despite not being approved, the Preservation and Development of Agricultural Land Framework Bill published on September 18th, 2020, automatically considers land under irrigation to have high potential. This is based in the high production capacity of irrigated agriculture, which is critical for food security at a local and regional scale. It is common for irrigated areas to indicate a high capital investment on the farm.

The land capability of the surrounding soils and the agricultural potential are very low to moderately high due to adequate climatic conditions (i.e., rainfall, temperature), availability of irrigation water and appropriate slope, which allows for intensive commercial agricultural practices.

With that being said, the proposed Eskom Kekana substation and powerline servitudes project is anticipated to have a negligible impact on agriculture because the actual footprint of disturbance of the substation infrastructure are located away from any agriculturally active areas. Also, the footprint of disturbance that precludes agricultural land use, constitutes only a negligible proportion of the available land surface area and all agricultural activities can continue completely unhindered underneath the powerlines. Consequently, any of the three (3) alternatives can be utilised for the proposed project. The only possible impact of the development was identified as minimal soil and land degradation because of land disturbance during construction and decommissioning.

However, the three alternatives were ranked in terms of their sensitivities and the preferred alternative is likely to have the least impact as the preferred alternative because of its close proximity to the residential areas where no agricultural activities are taking place at a larger scale and the relative short distance of the powerline servitude as compared to the other alternatives. Table 8 below depicts the ratings associated with the proposed alternatives.

Table 15:Preferred alternatives based on the outcomes of the assessment.

Preference	Corridor
1st Preference	Preferred Alternative
Second Preference	Alternative 3
Third Preference	Alternative 2

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

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

6. CONCLUSION

The proposed Eskom Kekana substation and powerline servitudes project is anticipated to have a negligible impact on agriculture because the actual footprint of disturbance of the substation infrastructure is located away from any agriculturally active areas. Also, the footprint of disturbance that precludes agricultural land use, constitutes only a negligible proportion of the available land surface area. All agricultural activities can continue completely unhindered underneath the powerlines. Consequently, any of the three (3) alternatives can be utilised for the proposed project. The only possible impact of the development was identified as minimal soil and land degradation because of land disturbance during construction and decommissioning.

However, the three alternatives were ranked in terms of their sensitivities. The preferred alternative is likely to have the least impact as the preferred alternative because of its close proximity to the residential areas where no agricultural activities are taking place at a larger scale and the relative short distance of the powerline servitude as compared to the other alternatives. Table 8 below depicts the ratings associated with the proposed alternatives.

Table 16:Preferred alternatives based on the outcomes of the assessment.

Preference	Corridor
1st Preference	Preferred Alternative
Second Preference	Alternative 3
Third Preference	Alternative 2

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

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

7. REFERENCES

Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983).

Council of GeoScience (CGS)., 2001.Geological survey (South Africa). Pretoria, South Africa.

Department of Agriculture, Forestry and Fisheries. Agricultural Geo-Referenced Information system (AGIS). Grazing Capacity Maps.

Department of Agriculture, Forestry and Fisheries.,1993. Agricultural Geo-referenced Information system (AGIS). Grazing Capacity Maps.

Gauteng Department of Agriculture and Rural Development, 2013.

Klingebiel, A. A., & Montgomery, P. H. (1961). Land-Capability Classification. Soil Conservation Service, U.S. Department of Agriculture, Agriculture Handbook No. 210.

Land Type Survey Staff, 1976-2006. Land type Survey Database. ARC-ISCW, Pretoria.

National Department of Agriculture, 2002. Development and Application of a Land Capability Classification System for South Africa

Scotney, D.M., Ellis, F., Nott, R.W., Taylor, K.P., Van Niekerk, B.J., Verster, E. & Wood, P.C., 1987. A system of soil and land capability classification for agriculture in the SA TBVC states. Dept. Agric., Pretoria.

Smith, B., 2006. The Farming Handbook. Netherlands & South Africa: University of KwaZulu Natal Press & CTA.

Soil Classification Working Group, 2018. Soil classification. A Natural and Anthropogenic System for South Africa. Mem. agric. nat. Resource. S. Afr. No. 15. Dept. Agric. Dev., Pretoria.

Zutari. (2022). MCWAP-2 River Management System Stage 3: Terms of Reference for the RMS Construction and Implementation (Statement of Work 1 – Weir Design): Zutari (Pty) Ltd.

Zutari. (2022). MCWAP-2 River Management Systems- Site Visit Report. Pretoria: Zutari (Pty) Ltd.

APPENDIX A: INDEMNITY

- This report is based on survey and assessment techniques which are 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 Pr. Sci. Nat. (114882)

16 April 2024

APPENDIX B: IMPACT ASSESSMENT METHODOLOGY

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 SPECIALIST

CURRICULUM VITAE OF TSHIAMO SETSIPANE

PROFESSIONAL EXPERIENCE

Soil Science Consultant

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

EDUCATION

- M.Sc. (Agric): Soil Science **01/2016– 03/2019**
  - Dissertation: Characterisation of hydropedological processes and properties of a sandstone and a tillite hillslope, Kwa-Zulu Natal, South Africa.

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

PROFESSIONAL MEMBERSHIP AND AFFILIATION

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