Soil and Agricultural Assessment Report as part of the Motuoane Exploration Right 386 Application

Matjabeng & Moqhaka Local Municipalities, Lejweleputswa & Fezile Dabi District Municipalities, Free State Province, South Africa

4/30/2026

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax : +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	**Soil and Agricultural Assessment Report as part of the Motuoane Exploration Right 386 Application**
Specialist Theme	Agricultural Assessment
Project Reference	Motuoane Exploration Right 386 Application
Report Version	4/30/2026
Environmental Assessment Practitioner	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES
Fieldwork & Report Writer	Masilabela Seepamore (SACNASP 113907)
Reviewer	Matthew Mamera (SACNASP 116356)
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, Amended. We have no conflicting interests in the undertaking of this activity and have no interest in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time, and budget) based on the principals of science.

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Background

The Biodiversity Company was appointed to conduct a soil and agricultural assessment for the proposed Motuoane Exploration Right 386 EA12/3/386 application. The proposed project area is located over an area of approximately 58 000 hectares, covering various farm portions in Welkom near towns of Virginal, Hennenman and Odendaalsrus, Free State Province. A map presenting the regional context of the Project Area can be seen in (Figure 1-1).

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the published Government Notices (GN) 320 in terms of NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" (Reporting Criteria). The National Web based Environmental Screening Tool (DFFE, 2026) has characterised the agricultural theme sensitivity of the project area having sensitivity ranging from "Low to Very High", with a key consideration of this assessment being the determination of agricultural theme sensitivities for the project.

This report aims to present and discuss the findings from the soil resources identified within the 500m buffered areas for drill sites and 50 m buffered area for seismic transects. The report will also identify the soil suitability and land potential of these soils, the land uses within the assessment area and the risks associated with the proposed Motuoane Exploration Right 386 Application project and associated infrastructure.

This report should be interpreted after taking into consideration the findings and recommendations provided by the specialist herein. Further, this report should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Project Description

Exploration Right (ER) 386 represents the consolidation of three previously individual tenures, TCP235, TCP240, and ERA341, which were merged into a single exploration right in 2024. This consolidation streamlines the management and exploration of saleable gases, including but not limited to Methane, Carbon Dioxide, Helium, and Nitrogen. The application for ER386 was submitted to cover all saleable gases within the consolidated area.

The exploration activities proposed under ER386 include:

- Identification and Assessment of Existing Blowers: Locating existing blowers within the exploration right and undertaking well workover and intervention where necessary.
- Drilling of New Exploration Wells: Drilling up to 5 new exploration wells at pre-identified or newly identified areas of interest.
- Establishment of Drilling Pads: Setting up 50x50 m drilling pads, which will require the clearance of indigenous vegetation.
- Access Road Construction: Establishing new temporary gravel access roads, only where necessary, to facilitate exploration activities.

- Seismic and Magnetotelluric Surveys: Conducting seismic and/or magnetotelluric surveys across the exploration right, focusing on areas of interest. Motuoane will first review existing seismic data from the Council for Geoscience and the Petroleum Agency. If no suitable data are available, new surveys will be conducted, following environmental protocols and with landowner consent. Preliminary survey transects are proposed to cover just over 70 km, with locations and lengths subject to change as exploration progresses.

- Vegetation Clearance: Clearing areas of 300 m² or more, and up to 1 hectare or more (but less than 20 hectares), of indigenous vegetation within specified geographical areas to facilitate exploration activities.

- Gas Composition Analysis: Performing gas composition analysis on samples from both existing boreholes and newly drilled wells within the exploration right.

- Site Rehabilitation and Closure: Rehabilitating all disturbed areas and ensuring the proper closure of blower sites upon completion of activities.

illustrates the spatial layout of the Motuoane ER386 project area, highlighting the key project components.

1.3 Project Area

The extent of the property/development footprint is referred to as the Project Area of Influence (PAOI) and pertains to the project area. A map of the PAOI and buffered area in relation to the local region is presented in Figure 1-1. A map illustrating the proposed layout assessed is presented in Figure 1-2. The current surrounding land use includes crop production and animal production, water courses and open veld.

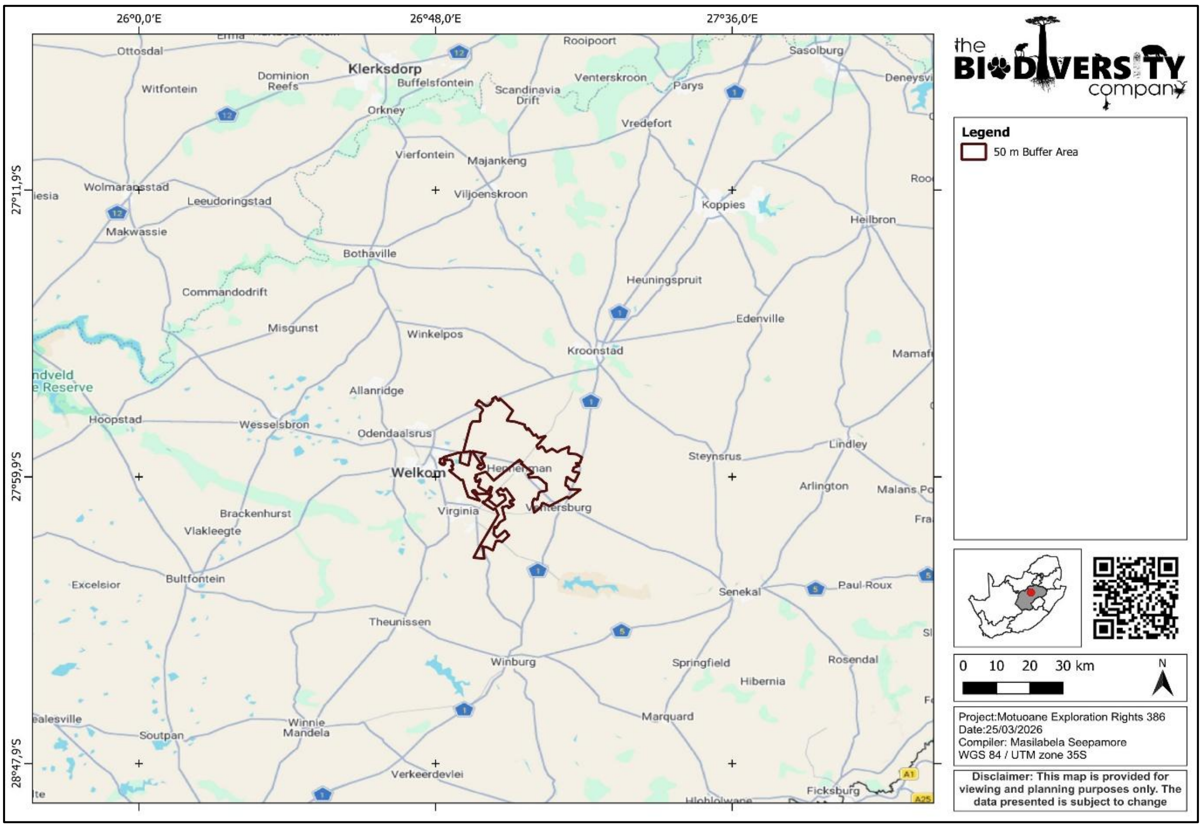


Figure 1-1 Spatial context of the proposed development

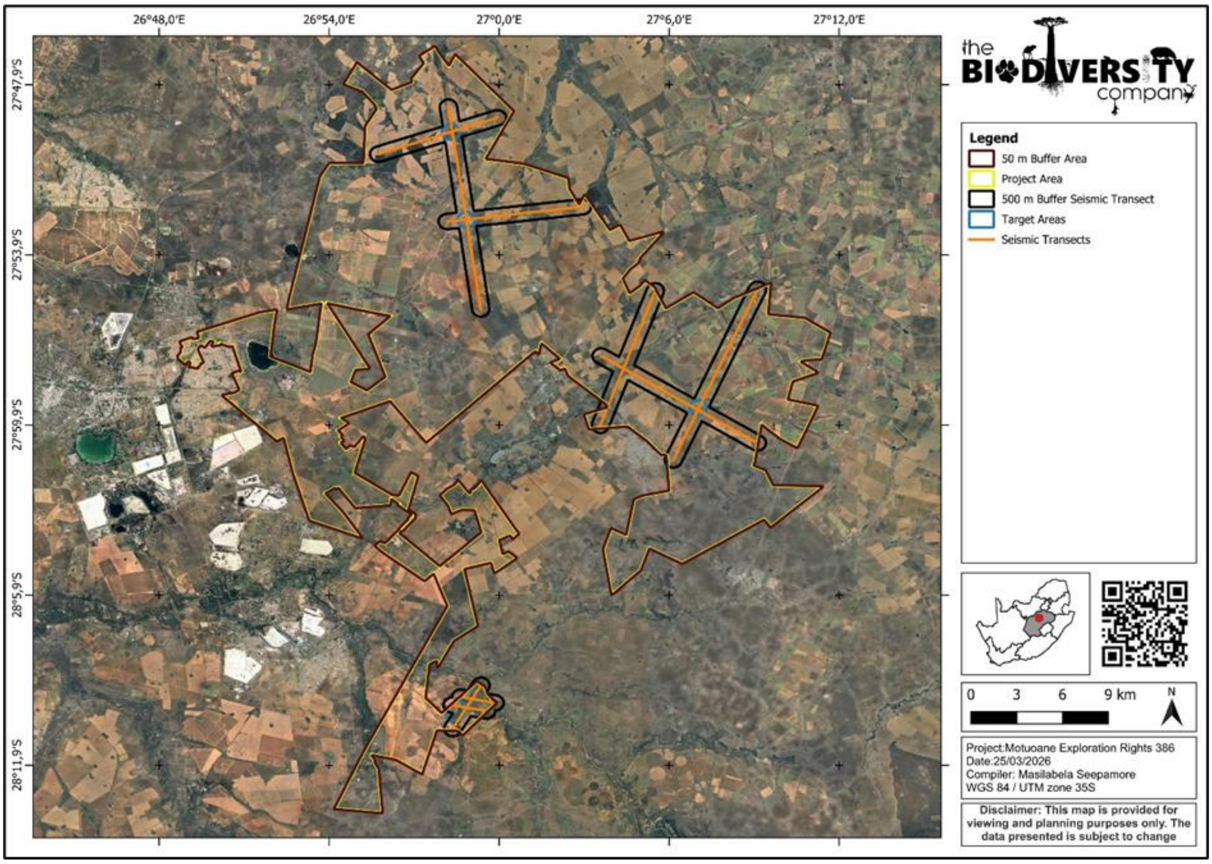


Figure 1-2 Map illustrating the layout of the proposed development

1.4 Terms of Reference

The principal aim of the assessment was to provide information to inform on the risk that the proposed activity has on the Agricultural Impact Assessment within the proposed project area. This was achieved through the following:

- Identification and description of any soil resources sensitive receptors that occur in the project area, and the manner in which these sensitive receptors may be affected by the proposed activity;
- Conducting of a desktop assessment to identify the relevant soil and agricultural important geographical features within or nearby to the project area;
- Conducting of a desktop assessment to compile soil resources and their sensitivity that may occur within the project area;
- Conducting of a field survey to ascertain the baseline findings of the present soil resources within the project area;
- Delineation and mapping of the soils and their respective sensitivities that occur within the project area;
- Identification of the manners in which the proposed project impacts the agricultural sensitivity of soil resources, and an evaluation of the level of risk that these potential impacts present; and

- The prescription of mitigation measures and associated recommendations for the identified risks.

1.5 Scope of Work

According to the National Web based Environmental Screening Tool, the proposed development is located within a “High” sensitivity land capability area. The protocols for minimum requirements (DEA, 2020) stipulates that if a proposed development is located within “High” sensitivities, an agricultural EIA assessment should be carried out. It is worth noting that according to the Assessment Protocol, a site inspection was conducted to determine the accuracy of these sensitivities following the generation of the site sensitivity report. After acquiring baseline information pertaining to soil resources within the 50 m buffer areas, it is the specialist’s opinion that the soil forms and associated land capabilities concur with the sensitivities stated by the screening tool. Therefore, an agricultural assessment will be compiled. This includes:

The feasibility of the proposed activities;

- Confirmation about the “Medium” and “High” sensitivities;
- The effects that the proposed activities will have on agricultural production in the area;
- Assessment must be undertaken on the preferred site and within the proposed development footprint.
- A map superimposing the proposed footprint areas, a 50 m regulated area as well as the sensitivities pertaining to the screening tool;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation;
- The specialist’s opinion regarding the approval of the proposed activities; and
- Any potential mitigation measures described by the specialist to be included in the management programme.

1.6 Assumptions and Limitations

The following aspects were considered as limitations;

- Soil fertility analysis was not conducted on-site for this report;
- The GPS used for ground truthing is accurate to within five meters. Therefore, the observation site’s delineation plotted digitally may be offset by at up to five meters to either side;
- No heavy metals have been assessed, nor fertility been analysed for the relevant classified soils; and
- Site assessment and verification for soil resources was only done on the proposed drilling sites; desktop information was used for soil resources within the entire exploration right seismic survey area.

1.7 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on soil and agricultural assessment as per the Government Notice 320 published in terms of NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" – the following has been assumed:

- An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of:

- "High sensitivity" for agriculture, must submit an Agricultural Agro-Ecosystem Specialist Assessment.

An Agricultural Agro-Ecosystem Specialist Assessment Report must contain the information as presented in below.

Table 2-1 Agricultural Agro-Ecosystem Specialist Assessment report information requirements as per the relevant protocol, including the location of the information within this report

Information to be Included (as per GN 320, 20 March 2020)	Report Section
details and relevant expertise as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the statement including a curriculum vitae;	8.4
a signed statement of independence by the specialist;	8.3
the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	2
a description of the methodology used to undertake the on-site assessment inclusive of the equipment and models used, as relevant;	Appendix A: Methodology
a map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool:	4.5 or Figure 4-8
an identification of any areas to be avoided, including any buffers;	4
a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development;	5.7.2
any conditions to which this statement is subjected;	6.1
where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	5
a description of the assumptions made and any uncertainties or gaps in knowledge or data.	1.5.7

A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

2 Fieldwork

The field surveys were completed from the 16th to the 19th of March 2026 to determine the soil forms, and current land uses within the assessed area (Figure 2-1**Error! Reference source not found.**). Seasonality has no bearing on the soil assessment and fieldwork is therefore deemed sufficient for the proposed development.

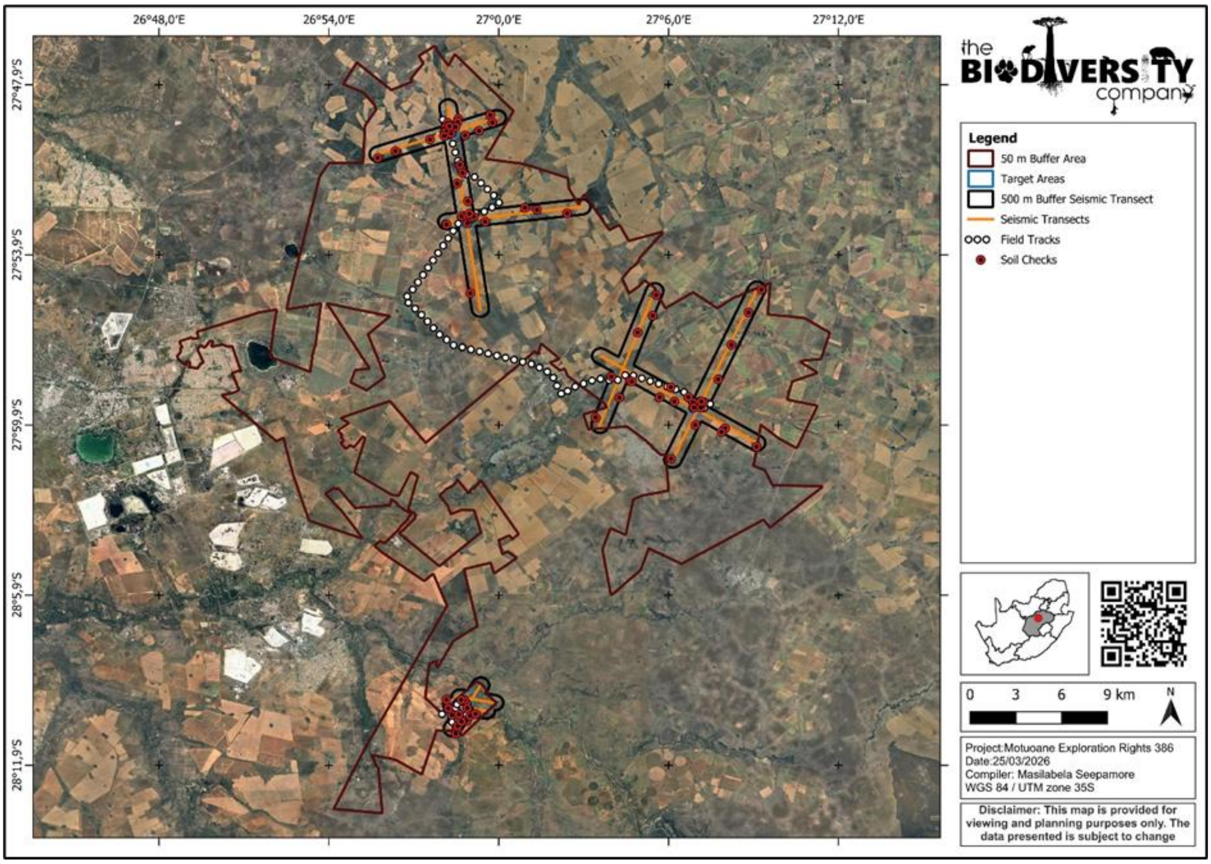


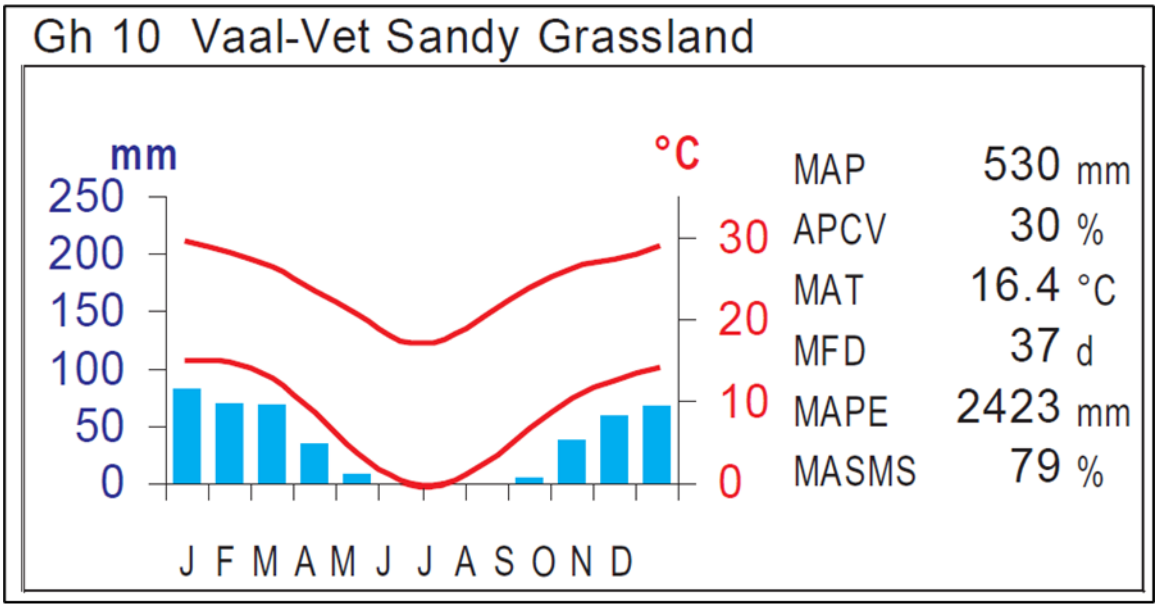
Figure 2-1 Map illustrating the sampled soil points of the field survey

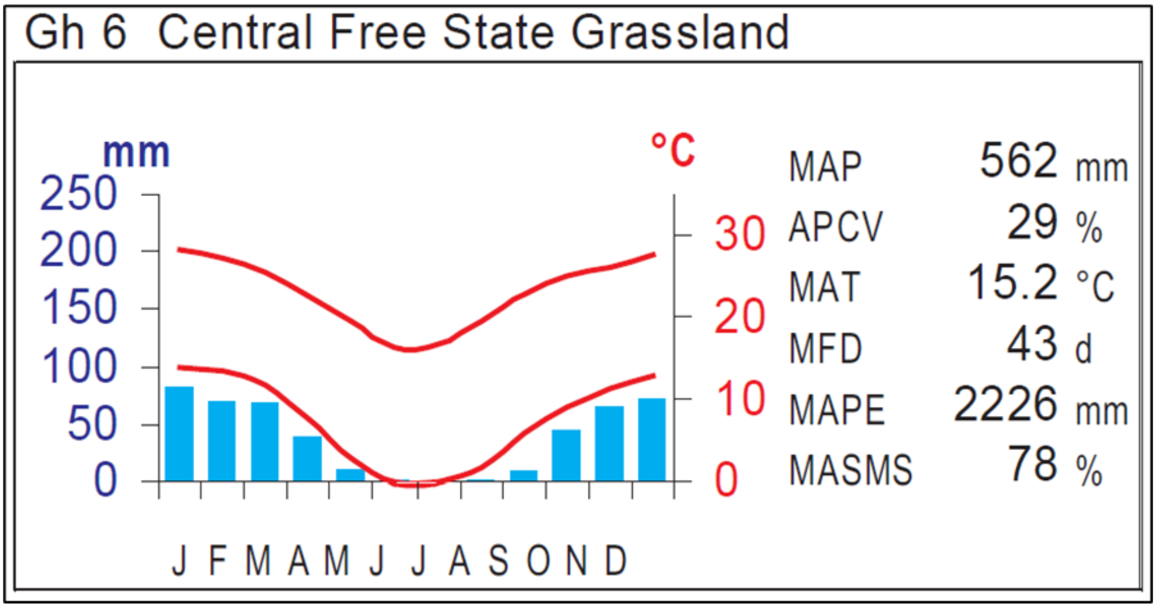
3 Project Area

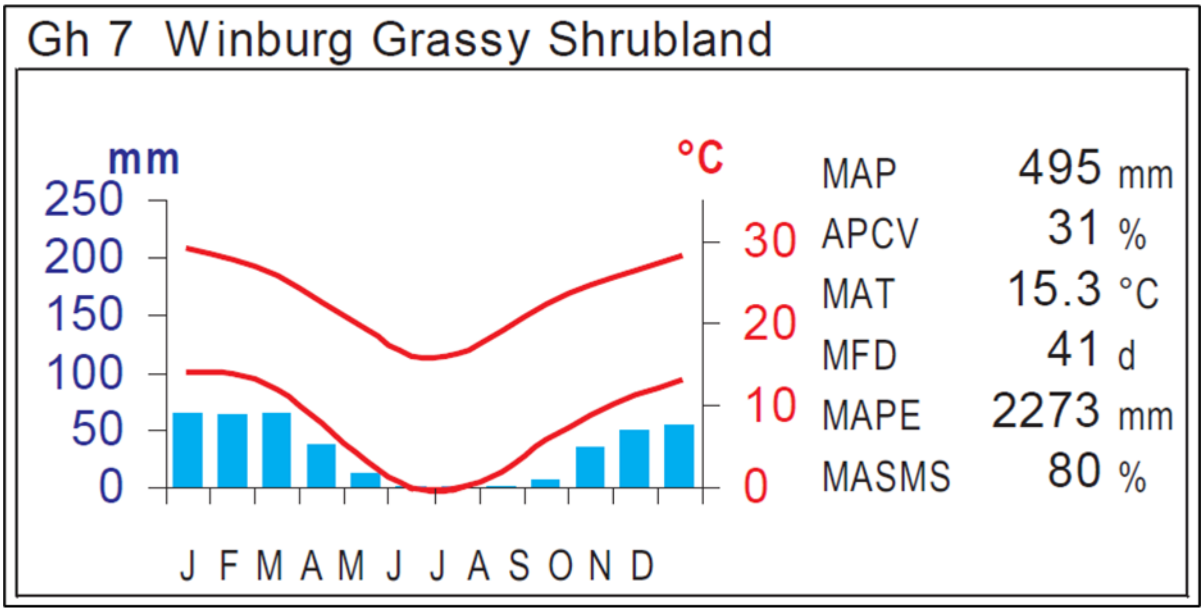
3.1 Desktop Information

3.1.1 Climate

The project area falls predominately under Vaal-Vet Sandy Grassland and other areas falls under Central Free State Grassland, Highveld Alluvial Vegetation, Highveld Salt Pans and Winburg Grassy Shrubland vegetation. The area is characterised with summer-rainfall, high summer temperature, and severe frost occurrence (43 days per annum) in winters. The overall mean average precipitation (MAP) of the proposed project area ranges from 500 mm to 560 mm (Mucina & Rutherford, 2006; Figure 3-1).


Gh 10 Vaal-Vet Sandy Grassland
mm
250
200
150
100
50
0
°C
30
20
10
0
J F M A M J J A S O N D
MAP 530 mm
APCV 30 %
MAT 16.4 °C
MFD 37 d
MAPE 2423 mm
MASMS 79 %


Gh 6 Central Free State Grassland
mm
250
200
150
100
50
0
°C
30
20
10
0
J F M A M J J A S O N D
MAP 562 mm
APCV 29 %
MAT 15.2 °C
MFD 43 d
MAPE 2226 mm
MASMS 78 %



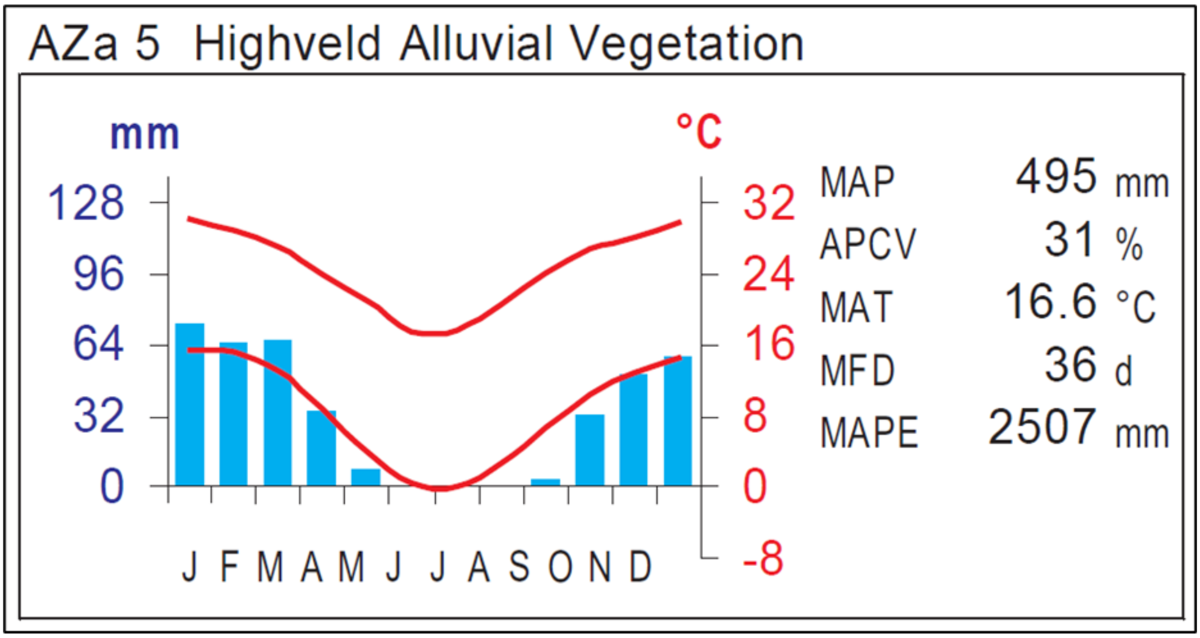


Figure 3-1 Summarised climate for the region (Mucina & Rutherford, 2006)

3.1.2 Geology & Soils

The geology of the area consists of Aeolian and colluvial sand overlying sandstone, mudstone, shale of the Karoo Supergroup (Mostly of the Ecca Group) as well as older Ventersdrop andesite and basement gnesis. the geology in turn supports Avalon, Westleigh, Clovelly soil forms from the Bd, Ba, Bc and Ae land types. Some areas within the project area consists of sedimentary mudstone and sandstone mainly of the Adelaide subgroup (Beaufort Group Supergroup) as well as those of Ecca Group (Karoo Supergroup). These geology in turn supports vertic, melanic and red soils (typical soil forms are Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg) from the Dc land types. Additionally, the geology consists of dolerite sills covering alternating layers of mudstone and sunstone of the sedimentary origin (Adelaide Subgroup of the Beaufort Group). These geology supports stoney Mispah and gravel-rich Glenrosa soil form from the Ea and Dc land types. Lastly, the geology of the area consists of Quaternary alluvial (fluvial) sediments, which gives rise to deep dandy to clayey (but mostly coarse sand) alluvial soils. The soil forms are Oakleaf, Dundee, Shortlands, Glenrosa and Mispah.

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area falls within the Bc 30, Bd 19, 20 and 21, Db1, Dc 1, 8, 9 and 12, and Ea 40 land type (Figure 3-2). The Bc 30 land type mainly consists of Mispah, Glenrosa, Bainsvlei and Willowbrook soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Bd 19 and 21 land types mainly consists of Avalon, Valsrivier and Dundee soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Bd 20 land type mainly consists of Clovelly, Hutton and Valsrivier soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Db 1 land type consists mainly of Sterkspruit and Willowbrook soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Dc 8 land type consists mainly of Valsrivier, Rensburg, Oakleaf and Dundee soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Dc 9 land type consists mainly of Hutton, Swartland, Katspruit and Willowbrook soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Dc 12 consists mainly of Mayo, Mispah, Swartland, Bonheim, Dundee and Oakleaf soil forms according to the Soil classification working group (1991), with the occurrence of rocky areas and other soils within the landscape. The Ea 40 land type consist mainly of Mayo, Arcadia, Oakleaf and Rensburg soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape.

The land terrain units for the featured land types and the illustrated expected soils are listed in the Figures and Tables below.

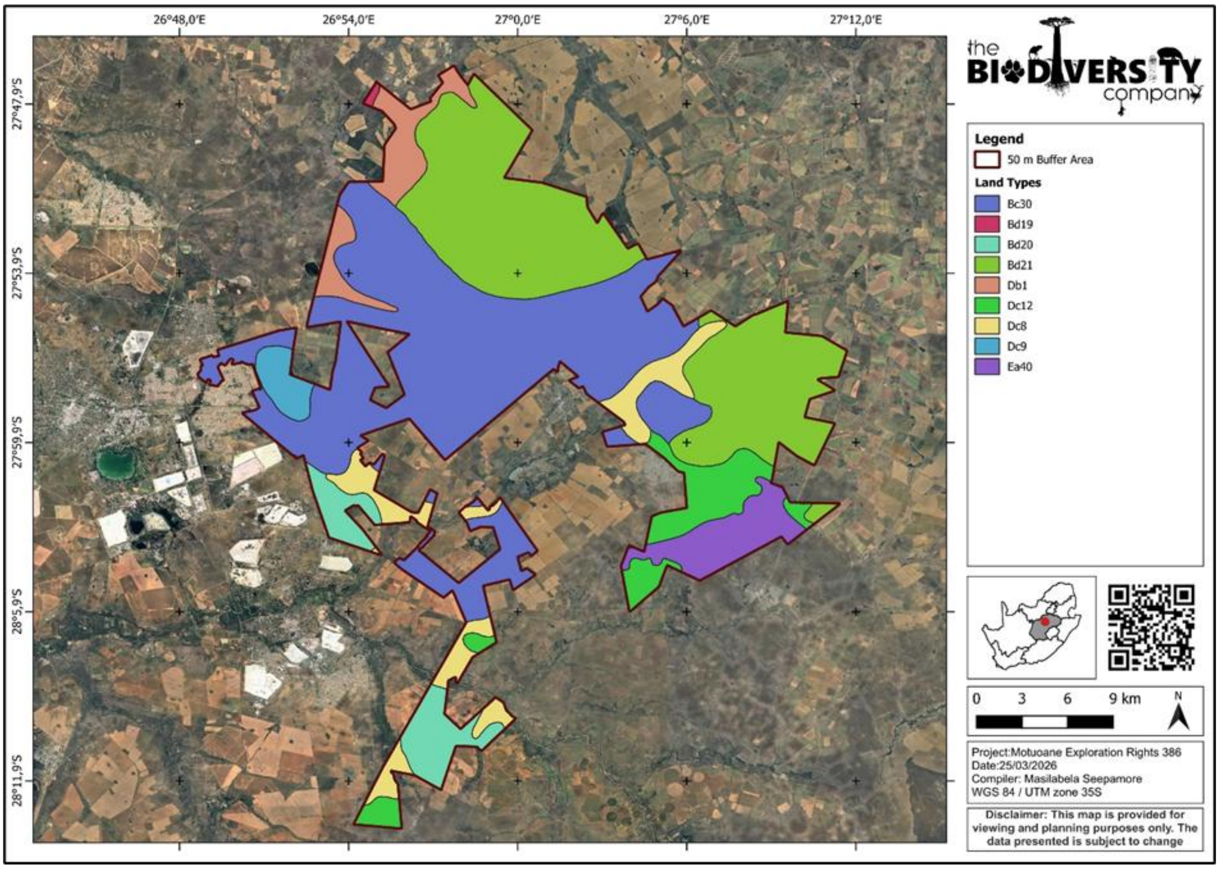


Figure 3-2 Land types associated with the proposed project area

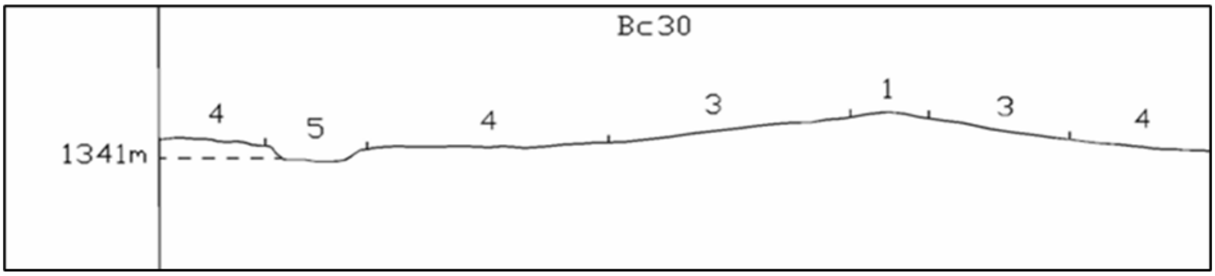


Figure 3-3 Illustration of land type Bc 30 terrain units (Land Type Survey Staff, 1972 - 2006)

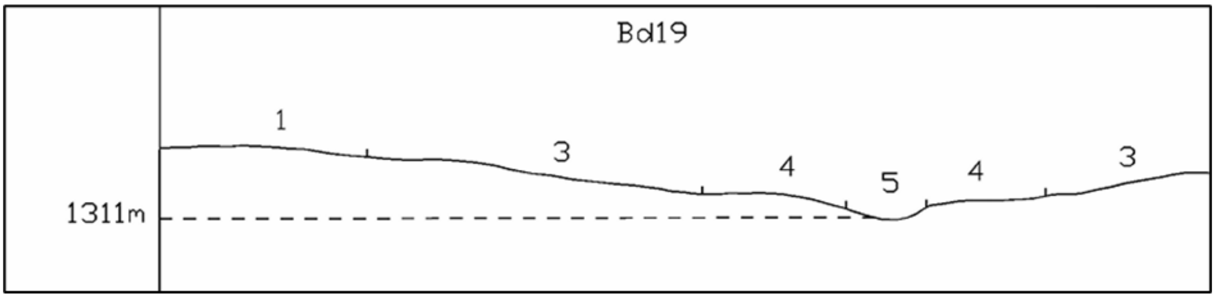


Figure 3-4 Illustration of land type Bd 19 terrain units (Land Type Survey Staff, 1972 - 2006)

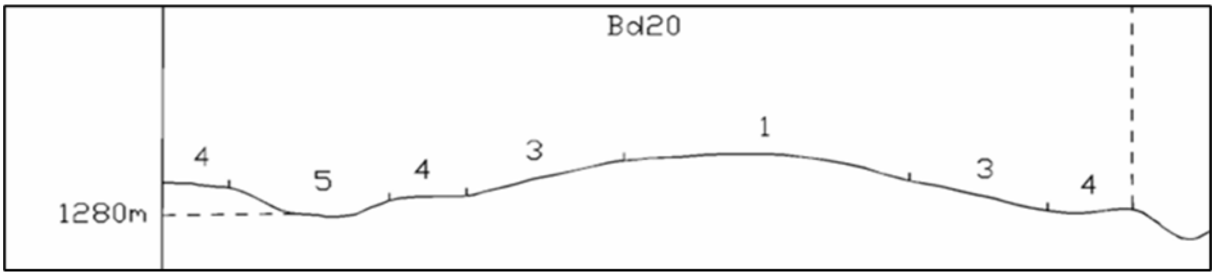


Figure 3-5 Illustration of land type Bd 20 terrain units (Land Type Survey Staff, 1972 - 2006)

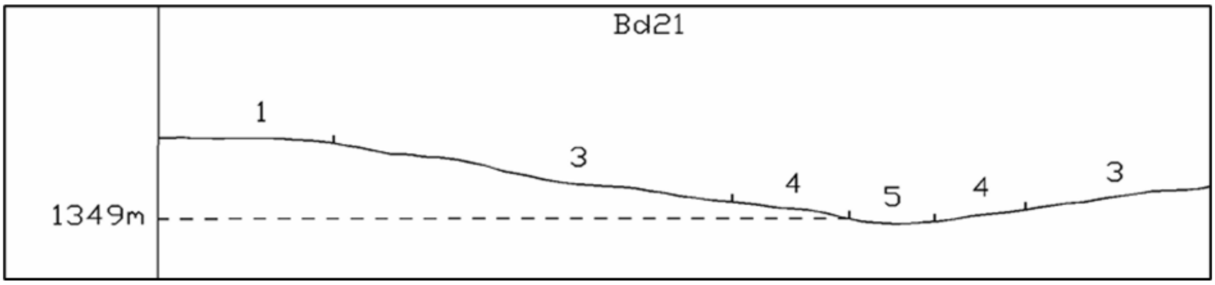


Figure 3-6 Illustration of land type Bd 21 terrain units (Land Type Survey Staff, 1972 - 2006)

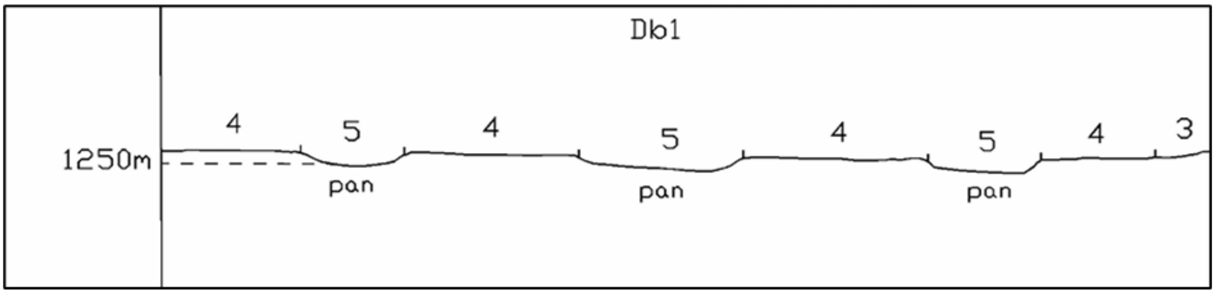


Figure 3-7 Illustration of land type Bd 21 terrain units (Land Type Survey Staff, 1972 - 2006)

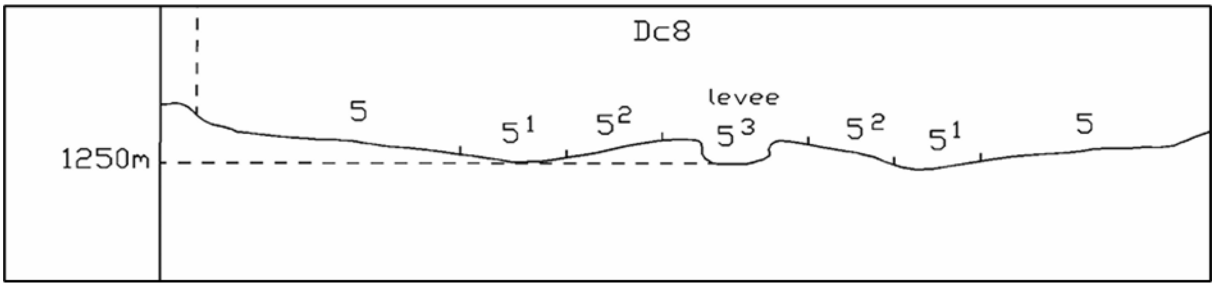


Figure 3-8 Illustration of land type Dc 8 terrain units (Land Type Survey Staff, 1972 - 2006)

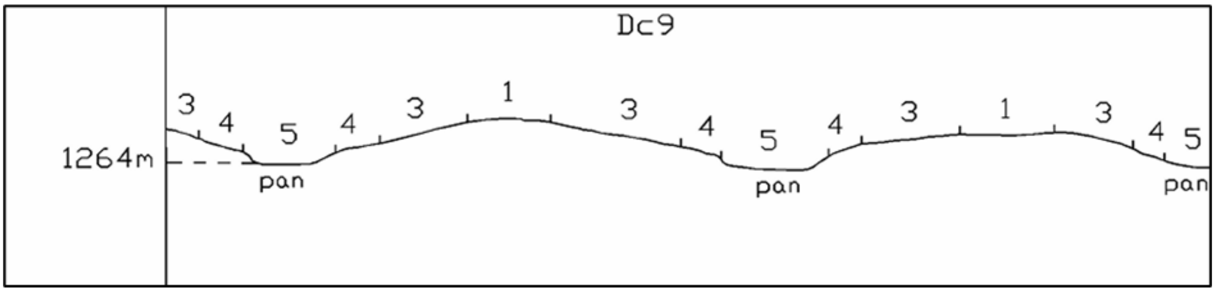


Figure 3-9 Illustration of land type Dc 9 terrain units (Land Type Survey Staff, 1972 - 2006)

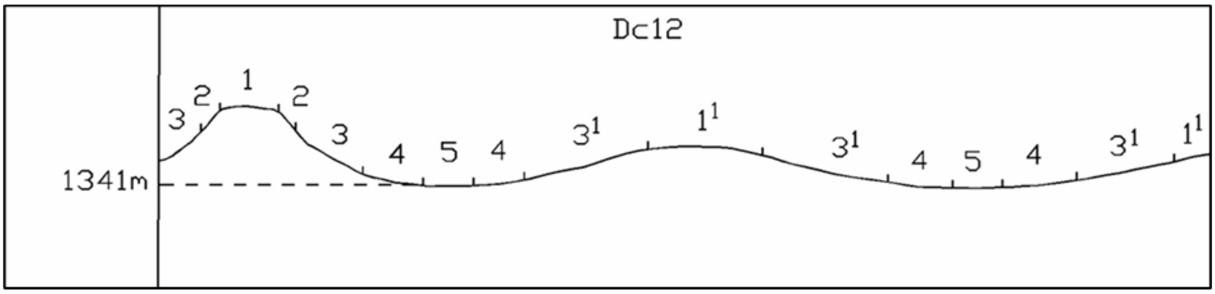


Figure 3-10 Illustration of land type Dc 12 terrain units (Land Type Survey Staff, 1972 - 2006)

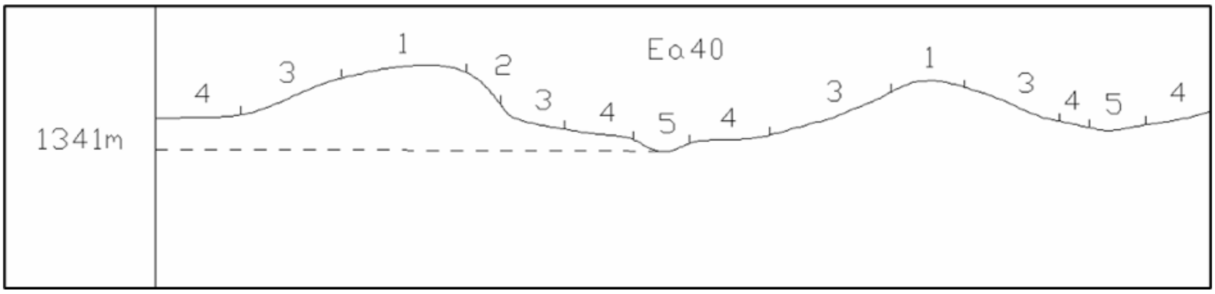


Figure 3-11 Illustration of land type Ea 40 terrain units (Land Type Survey Staff, 1972 - 2006)

Table 3-1 Soils expected at the respective terrain units within the Bc 30 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (3%)		3 (30%)		4 (64%)		5 (3%)	
Mispah, Glenrosa	50%	Bainsvlei	48%	Bainsvlei	36%	Willowbrook	67%
Bare Rocks	33%	Hutton	27%	Westleigh	27%	Sterkspruit	33%
Hutton	17%	Bare Rocks	10%	Hutton	17%		
		Westleigh	10%	Avalon	12%		

		Avalon	3%	Sterkspruit	3%
		Mispah, Glenrosa	2%	Oakleaf	3%
				Mispah, Glenrosa	1%
				Bare Rocks	1%

Table 3-2 Soils expected at the respective terrain units within the Bd 19 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (33%)		**3 (50%)**		**4 (11%)**		**5 (6%)**	
Avalon	67%	Avalon	38%	Valsrivier	50%	Dundee	62%
Westleigh	18%	Westleigh	38%	Sterkspruit	27%	Bonheim	18%
Bainsvlei, Hutton	12%	Valsrivier	12%	Bonheim	9%	Valsrivier	17%
Glenrosa	3%	Bainsvlei, Hutton	8%	Kroonstad	9%	Sterkspruit	13%
		Sterkspruit	1%	Swartland	5%		
		Kroonstad	1%				
		Glenrosa	1%				
		Swartland	1%				

Table 3-3 Soils expected at the respective terrain units within the Bd 20 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (55%)		**3 (40%)**		**4 (3%)**		**5 (2%)**	
Clovelly	65%	Clovelly	45%	Hutton	60%	Valsrivier	55%
Avalon	30%	Hutton	25%	Valsrivier	18%	Arcadia, Rensburg	20%
Valsrivier	3%	Avalon	20%	Avalon	10%	Katspruit	15%
Katspruit	1%	Valsrivier	8%	Clovelly	5%	Oakleaf	10%
Arcadia, Rensburg	1%	Katspruit	1%	Oakleaf	5%		
		Arcadia, Rensburg	1%	Katspruit	1%		
				Arcadia, Rensburg	1%		

Table 3-4 Soils expected at the respective terrain units within the Bd 21 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (33%)		**3 (50%)**		**4 (11%)**		**5 (6%)**	
Avalon	67%	Avalon	38%	Valsrivier	50%	Dundee	62%
Westleigh	18%	Westleigh	38%	Sterkspruit	27%	Bonheim	18%
Bainsvlei, Hutton	12%	Valsrivier	12%	Bonheim	9%	Valsrivier	17%
Glenrosa	3%	Bainsvlei, Hutton	8%	Kroonstad	9%	Sterkspruit	13%
		Sterkspruit	1%	Swartland	5%		
		Kroonstad	1%				
		Glenrosa	1%				

	Swartland	1%

Table 3-5 Soils expected at the respective terrain units within the Db 1 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units					
3 (5%)		**4 (60%)**		**5 (35%)**	
Sterkspruit	30%	Sterkspruit	34%	Willowbrook	26%
Bare Rock	20%	Swartland	31%	Katspruit	26%
Mispah, Glenrosa	20%	Mispah, Glenrosa	12%	Bonheim	23%
Swartland	20%	Estcourt	10%	Oakleaf	24%
Westleigh	10%	Bare Rock	3%	Bare Rock	5%
		Oakleaf	3%	Dundee, Fernwood	4%
		Bonheim	2%	Mispah, Glenrosa	1%
		Westleigh	2%		
		Arcadia	2%		

Table 3-6 Soils expected at the respective terrain units within the Dc 8 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
5 (44%)		**5 (1) (13%)**		**5(2) (27%)**		**5 (3) (16%)**	
Valsrivier	48%	Rensburg	59%	Oakleaf	66%	Dundee	37%
Arcadia	42%	Arcadia	41%	Valsrivier	32%	Stream Beds	28%
Sterkspruit	6%			Stream Beds	2%	Fernwood	22%
Bonheim	4%					Oakleaf	13%

Table 3-7 Soils expected at the respective terrain units within the Dc 9 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (10%)		**3 (27%)**		**4 (41%)**		**5 (22%)**	
Hutton	100%	Hutton	88%	Swartland	28%	Katspruit, Willowbrook	91%
		Clovelly	11%	Valsrivier	24%	Valsrivier	5%
		Oakleaf	1%	Oakleaf	23%	Arcadia	2%
				Sterkspruit	17%	Sterkspruit	1%
				Arcadia	4%	Estcourt	1%
				Estcourt	3%		
				Mispah	1%		

Table 3-8 Soils expected at the respective terrain units within the Dc 12 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units													
1 (3%)		1 (1) (20%)		2 (1%)		3 (6%)		3 (1) (38%)		4 (24%)		5 (8%)	
Bare Rocks	33%	Mispah	37%	Bare Rocks	60%	Bare Rocks	33%	Swartland	34%	Bonheim	29%	Dundee, Oakleaf	41%
Mayo	23%	Swartland	19%	Mispah	30%	Mayo	25%	Mispah	18%	Swartland	27%	Katspruit	27%
Mispah	21%	Glenrosa	13%	Glenrosa	10%	Swartland	17%	Bonheim	14%	Valsrivier	15%	Stream Beds	13%
Glenrosa	13%	Westleigh	12%			Mispah	17%	Valsrivier	9%	Arcadia	15%	Valsrivier	6%
Swartland	10%	Mayo	6%			Glenrosa	8%	Glenrosa	7%	Sterkspruit	4%	Bonheim	5%
		Bonheim	5%					Arcadia	7%	Mispah	4%	Arcadia	4%
		Valsrivier	3%					Westleigh	5%	Mayo	3%	Mayo	4%
		Bare Rocks	3%					Mayo	3%	Glenrosa	2%		
		Hutton	2%					Sterkspruit	2%	Bare Rocks	1%		
								Bare Rocks	1%				

Table 3-9 Soils expected at the respective terrain units within the Ea 40 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units									
1 (20%)		2 (1%)		3 (54%)		4 (20%)		5 (5%)	
Mayo	45%	Bare Rocks	80%	Arcadia	34%	Arcadia	44%	Oakleaf	30%
Bare Rocks	20%	Mispah	20%	Mispah	30%	Valsrivier	15%	Rensburg, Willowbrook	20%
Mispah	17%			Mayo	17%	Mispah	10%	Arcadia	20%
Glenrosa	13%			Glenrosa	6%	Mayo	10%	Mayo	10%
Swartland	5%			Swartland	5%	Bonheim	9%	Stream Beds	10%
				Bare Rocks	5%	Glenrosa	5%	Bare Rocks	6%
				Valsrivier	2%	Swartland	5%	Bonheim	4%
				Bonheim	1%	Bare Rocks	2%		

3.1.3 Terrain

The slope percentage of the proposed project area has been calculated and is illustrated in Figure 3-12. Most of the project area is characterised by a slope percentage ranging between 0 to 5% with some irregularities in areas with slopes between 20 to 22%. This illustration indicates a mostly uniform topography with occurrence of some fairly gentle sloping being present. The Digital Elevation Model (DEM) of the project area (Figure 3-13) indicates an elevation of 1 303 to 1 350 Metres Above Sea Level (MASL).

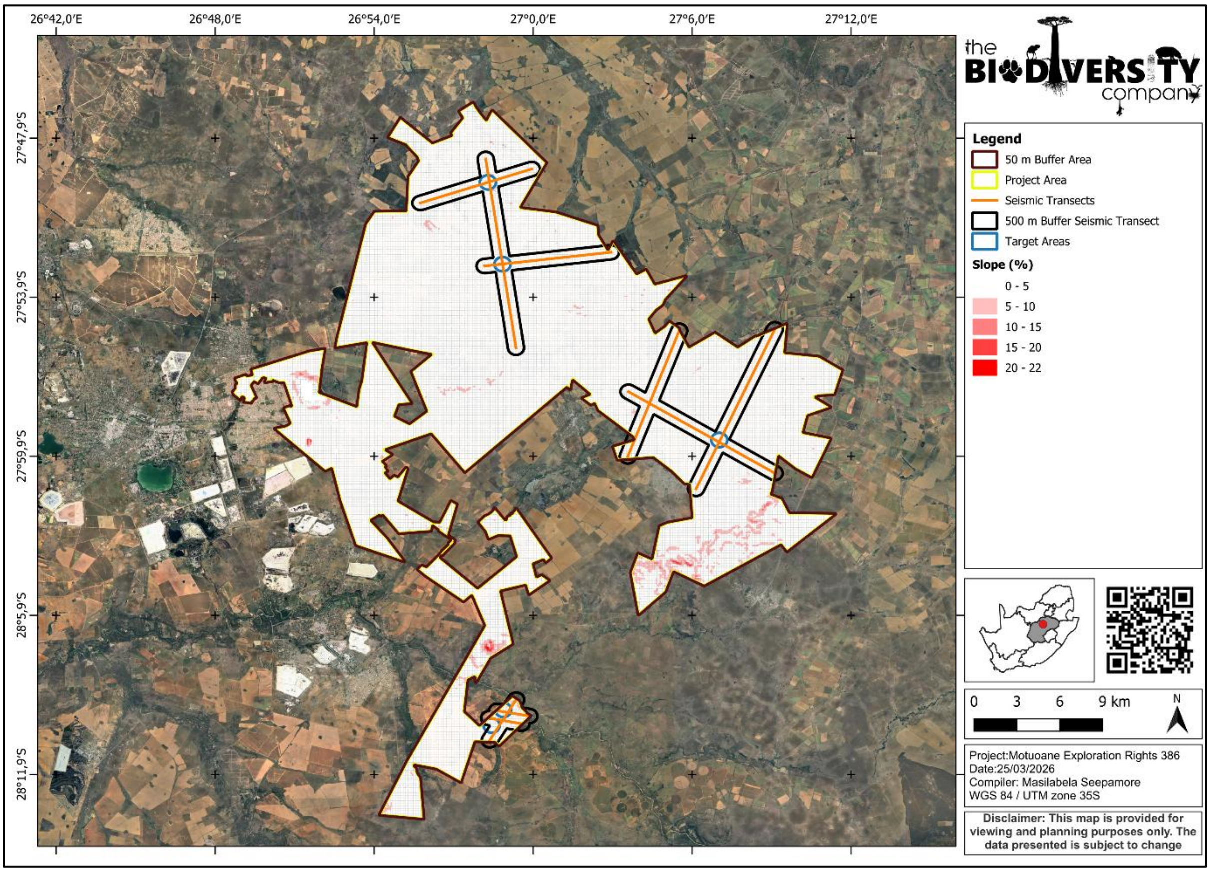


Figure 3-12 Slope percentage map for the project area

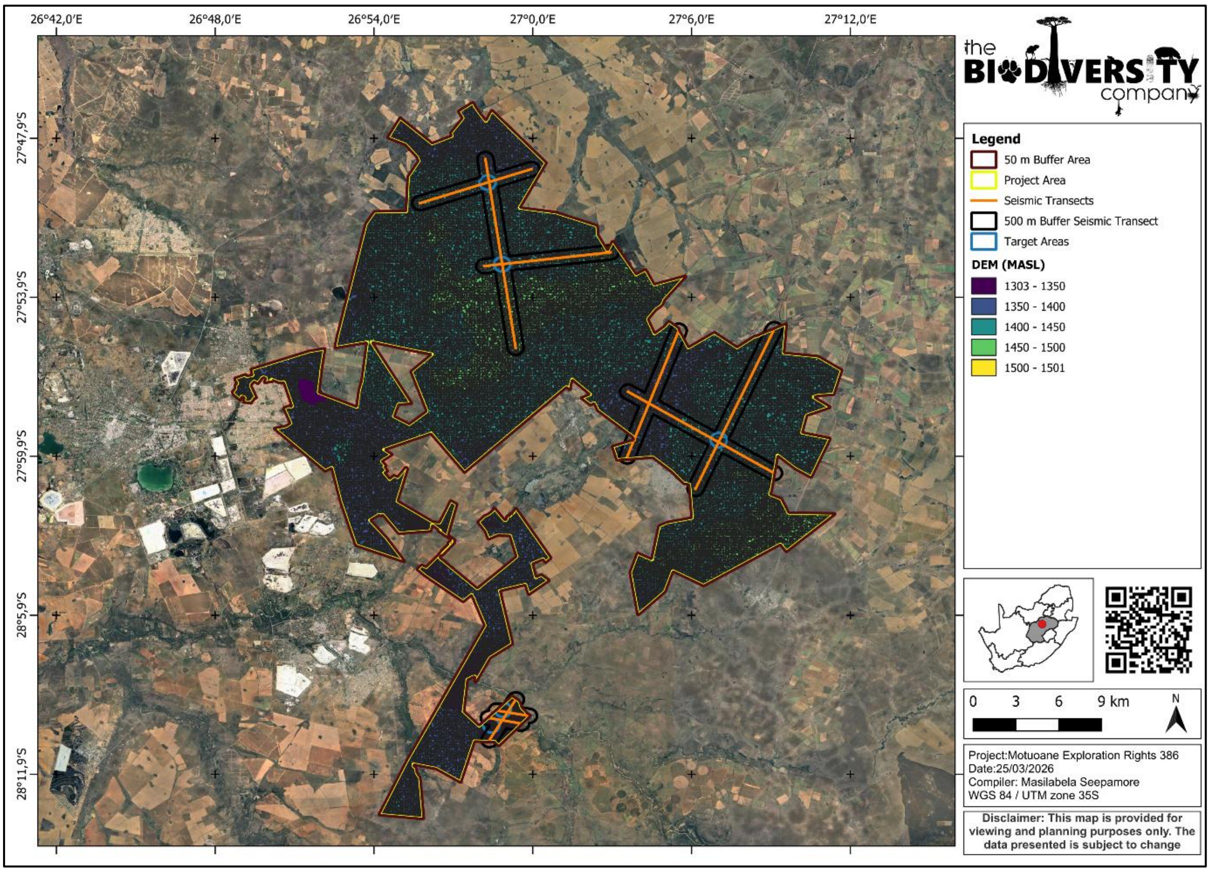


Figure 3-13 Digital Elevation Model of the project area (Metres Above Sea Level)

4 Results and Discussion

4.1 Description of Soil Profiles and Diagnostic Horizon

Soil profiles were studied up to the bedrock where possible or a depth of 1.2 m to identify specific diagnostic horizons which are vital in the soil classification processes as well as determining the agricultural potential and land capability. The most sensitive soil forms have been considered. The following diagnostic horizons were identified during the site assessment:

- Orthic topsoil horizon;
- Vertic topsoil horizon;
- Yellow-brown apedal subsoil horizon;
- Red apedal subsoil horizon;
- Albic subsoil horizon;
- Gley horizon;
- Gleyic horizon;
- Soft Plinthic subsoil horizon;
- Pedocutanic subsoil horizon;

- Lithic horizon; and
- Hard rock horizon.

4.1.1 Orthic topsoil horizon

Orthic topsoil are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one Orthic A topsoil to another (i.e., colouration, structure etc) (Soil Classification Working Group, 2018).

4.1.2 Vertic topsoil horizon

Vertic horizons are strongly structured, dark clay horizons, with high smectic clay content that gives rise to pronounced swell-shrink processes. Vertic horizons crack strongly when dry and sticky when wet, some vertic horizons have a strong tendency to invert, depositing calcium carbonate nodules and/or stones and rocks on the surface. Mechanical disturbance of vertic horizons may give rose to massive or altered surface structural aggregates (Soil Classification Working Group, 2018).

4.1.3 Yellow-brown apedal subsoil horizon

The yellow-brown apedal horizon is similar to that of the red apedal horizon in all aspects except for the colour and the iron-oxide processes involved with the colouration thereof. This diagnostic soil horizon rarely occurs in parent rock high in iron-oxides and will rather be associated with Quartzite, Sandstone, Shale, and Granites (Soil Classification Working Group, 2018).

4.1.4 Red apdeal susbsoil horiozn

The red apedal horizon has defined red colour and has a structure weaker than moderate in the moist state. The essential uniform, red pigmentation is due to the presence of evenly distributed hematite which, even when it is not necessarily the dominant iron oxide present, typically indicates well aerated soil conditions in warmer climates. The sandy loam and finer textured horizons have a strong micro-aggregates structure, resulting in stable pores and a moderate to high infiltration rate. The red apedal horizons are easily tilled and usually support an active microflora and macrofaunal populations (Soil Classification Working Group, 2018).

4.1.5 Albic subsoil horizon

Albic horizons are often characterised by uniform white-greyish colours from the residual clay and quartz particles making up the matrix of the horizon. The main characteristic of this diagnostic horizon is a bleached colouration, which is a resultant product of distinct redox and ferrolysis pedological processes combined with eluvial processes. According to the Soil Classification Working Group (2018), albic horizons often receive lateral sub-surface flows from hillslope processes.

4.1.6 Gley horizon

Gley horizons that are well developed and have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a gley horizon. The structure of a gley horizon mostly is characterised as strong pedal, with low hydraulic conductivities due to high clay content (clayey texture), although sandy gley horizons are also known to occur. The gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths (Soil Classification Working Group, 2018).

4.1.7 Gleyic horizon

The gleyic horizon is a subsurface horizon displaying low chroma, grey and light yellow colours in ped exteriors, or in fissures in partly weathering material. The remaining soil or lithic material exhibits variegated, higher chroma colouration. The morphology of the horizon indicates less reduction and apparently shorter durations of water saturation than the gley horizon (Soil Classification Working Group, 2018).

4.1.8 Soft Plinthic susbsoil horiozn

The soft plinthic horizon has apedal structure and prominent redox morphology displayed in a vesicular pattern as randomly distributed redox iron and manganese accumulations that are not related to peds and biosphere. These are visible as high chroma mottles, together with redox depletions also of high values yet with low chroma soil matrix or mottles. Distribution of the soft plinthic horizon correlates with that of the hillslope hydrology with its dominant occurrence in sandy soils and flat terrain, and with increasing expression at the low slope angles in semi-arid to sub-humid climates (Soil Classification Working Group, 2018).

4.1.9 Pedocutanic subsoil horiozn

The pedocutanic horizon is a moderately to strongly structured subsurface horizon, with distinct to prominent cutans on the ped surfaces and a sandy clay loam to clay texture. A clear textural contrast between a sandier surface horizon and a higher clay upper subsurface horizon is a common feature of the pedocutanic horizon. peds commonly exhibits brown to dark brown matrix colours while yellowish to brownish colour variation within ped interiors id permitted ((Soil Classification Working Group, 2018).

4.1.10 Lithic horizon

A lithic horizon is a subsurface horizon with morphology expression of pedogenic alteration that ranges from strong weathering of the underlying country rock, with a friable soil-like morphology, through to the soil materials intimately mixed with partly weathered to hard rock fragments. Evidence of gleying in the form of iron minerals in the soil matrix or in the partly weathered fragments may be present in the wetter variants (Soil Classification Working Group, 2018).

4.1.11 Hard Rock horizon

The horizon comprises hard country rock where primarily physical weathering has taken place, ranging from a fractured rock horizon variant with numerous closely aligned fracture planes, but lacking soil development between fractures, to a solid rock horizon variant with limited and widely spaced fractures. It includes all igneous, sedimentary and metamorphic rock types. The horizon has very limited capability for root development of most annual plants, though roots of selected trees and shrubs may penetrate the limited planes occupying specialized ecological niche environments (Soil Classification Working Group, 2018).

4.2 Description of Soil Forms and Soil Families

During the site assessment various soil forms were identified (Figure 4-1 and Figure 4-2). These soil forms are described in Table 4-1 according to depth, clay percentage, indications of surface crusting, signs of wetness and percentage rock. The soil forms are followed by the soil family and in brackets the maximum clay percentage of the topsoil. Soil family characteristics are described in Table 4-2.

Table 4-1 Summary of soils identified within the project area

Diagnostic Horizon		Soil Forms													
		Ermelo 2220 (15)	Griffin 2220 (15)	Hutton 2222 (15)	Clovelly 2222 (15)	Pinedene 2220 (15)	Westleigh 2200 (15)	Katspruit 1210 (15)	Kroonstad 2110 (15)	Rensburg 1000 (35)	Sepane 1210 (15)	Arcadia 1120 (35)	Johannesburg 2100 (15)	Stilfontein 1200 (15)	Grabouw 2000 (15)
Topsoil	Depth (mm)	0-300	0-300	0-300	0-300	0-300	0-300	0-200	0-200	0-300	0-300	0-200	-	-	-
	Clay (%)	0-15	0-15	0-15	0-15	0-15	0-15	0-15	0-15	35	0-15	35	-	-	-
	Signs of Wetness	None	None	None	None	None	None	None	None	None	None	None	-	-	-
	Rock (%)	0	0	5	0	0	0	0	0	0	0	0	-	-	-
	Surface crusting	None	None	None	None	None	None	None	None	None	None	None	-	-	-
Subsoil B1	Depth (mm)	300-1200	300-800	300-1200	5300-750	300-600	300-600	200-1200	200-800	300-1200	300-700	200-400	-	-	-
	Clay (%)	0-15	0-15	0-15	0-15	0-15	20-35	25-30	15	35	35	25	-	-	-
	Signs of Wetness	None	None	None	None	None	Mottles	Gley	Bleached	Bleached	None	None	-	-	-
	Rock (%)	0	10	0	0	0	0	0	0	0	0	40	-	-	-
Subsoil B2	Depth (mm)	-	800-1200	-	750-1200	600-1200	600-1200	-	800-1200	-	700-1200	-	-	-	-
	Clay (%)	-	15	-	0-15	30	30	-	20-25	-	35	-	-	-	-
	Signs of Wetness	-	-	-	None	Mottles	Mottles	-	Mottles	-	Mottles	-	-	-	-
	Rock (%)	-	0	-	30	20	20	-	0	-	20	-	-	-	-

Table 4-2 Description of soil family characteristics

Soil Form/Family	Topsoil Colour	Base Status	Textural Contrast
Ermelo	Chromic Topsoil	Mesotrophic	Luvic
Griffin	Chromic Topsoil	Mesotrophic	Luvic
Hutton	Chromic Topsoil	Mesotrophic	Luvic
Clovelly	Chromic Topsoil	Mesotrophic	Luvic
Katspruit	Dark Topsoil	Dystrophic	Luvic
Kroonstad	Dark Topsoil	Dystrophic	Luvic
Rensburg	Dark Topsoil	Dystrophic	Luvic
Sepane	Chromic Topsoil	Dystrophic	Luvic
Arcadia	Dark Topsoil	Dystrophic	Aluvic
Johannesburg	-	-	Aluvic
Stilfontein	-	-	Aluvic
Grabouw	-	-	Aluvic

4.3 Discussion

Fourteen (14) representative soil forms were identified in the proposed seismic survey drilling areas namely, Ermelo, Griffin, Hutton, Clovelly, Pinedene, Westleigh, Katspruit, Kroonstad, Rensburg, Sepane, Arcadia, Johannesburg, Stilfontein and Grabouw soil forms (Figure 4-1).

The most sensitive soil forms suitable for crop production identified within the seismic survey drilling areas includes the Ermelo, Griffin, Hutton and Clovelly soil forms. The Ermelo soil form consists of an orthic topsoil horizon on top of a thick yellow brown apedal horizon. The Griffin soil form consists of an orthic topsoil horizon on top of a yellow brown apedal horizon underlain with a red apedal horizon below. The Hutton soil form consist of an orthic topsoil horizon top of a thick red apedal horizon. The Clovelly soil form consists of an orthic topsoil horizon on top of a yellow brown apedal underlain with a lithic horizon below. These soils are usually used for crop farming due to their good drainage, aeration and nutrient and water holding capabilities. Furthermore, these soils are characterised with a high suitability for crop production due to the permeability of their underlying horizons that promotes water infiltration, root penetration and gas exchange.

The other soils identified within the proposed target areas include the Pinedene and Westleigh soil forms. The Pinedene soil form consists of an orthic topsoil horizon on top of a yellow brown apedal horizon underlain with a gleyic horizon below. The Westleigh soil form consists of an orthic topsoil horizon on top of a soft plinthic horizon underlain with a gleyic horizon below. These soil forms are usually used for crop farming due to their good nutrient and water holding capacity. However, these soils are characterised by period saturation of the subsurface horizons which may subject crops to waterlogging conditions.

Three (3) hydromorphic soils with signs of wetness identified within the proposed target areas includes the Katspruit, Kroonstad and Rensburg soil forms. The Katspruit soil form consist of an orthic topsoil horizon on top of a gley horizon. The Kroonstad soil form consists of an orthic topsoil horizon on top of an albic horizon underlain with a gley horizon below. The Rensburg soil form consists of a vertic topsoil horizon underlain with a gley horizon.

The less sensitive soil forms with low suitability for crop production identified within the proposed target areas includes the Sepane and Arcadia soil forms. The Sepane soil form consists of an orthic topsoil horizon on top of a pedocutanic horizon underlain with a gleyic horizon below. These soils are characterised by high clay content which may impede drainage, aeration, and root penetration.

Three (3) anthropogenic soils with transported material were also identified within the proposed target areas, namely Johannesburg, Stilfontein and Grabouw soil form. The Johannesburg urban Technosols is characterised as the land under graveyard or cemeteries. The Stilfontein hydric Technosols is characterised as anthropogenic material which is artificially saturated by natural quality water. The Grabouw physically disturbed Anthrosols is characterised as the land which is physically disturbed by anthropogenic actives for agricultural purposes. These soil forms are characterised by extremely severe limitation for crop production and are more suitable for wildlife practices.

The desktop assessment database (Land Type Survey Staff, 1972 – 2006) for the areas forming the entire seismic right area excluding the site verified proposed seismic survey drilling areas indicates that the areas are characterised with the Dundee, Avalon, Bainsvlei, Hutton, Clovelly, Oakleaf, Rensburg, Willowbrook, Valsrivier, Swartland, Sterkspruit, Glenrosa and Mispah soil forms. The Dundee, Avalon, Bainsvlei, Hutton, Clovelly and Oakleaf soil forms are mostly suitable for cropping practices. The Rensburg and Willowbrook are characterised by hydromorphic conditions associated with watercourse and wetlands areas. The Valsrivier, Swartland, Sterkspruit, and Glenrosa and Mispah soil forms have high clay contents and restricted depths which can limit most cropping practices, respectively. Some of the identified soil horizons within the proposed seismic survey drilling, as well as the current land uses are illustrated in Figure 4-2 to Figure 4-3, and Figure 4-4, respectively. . Moreover, some of the current land uses within the 50 m buffer of the proposed project area are illustrated in Figure 4-5.

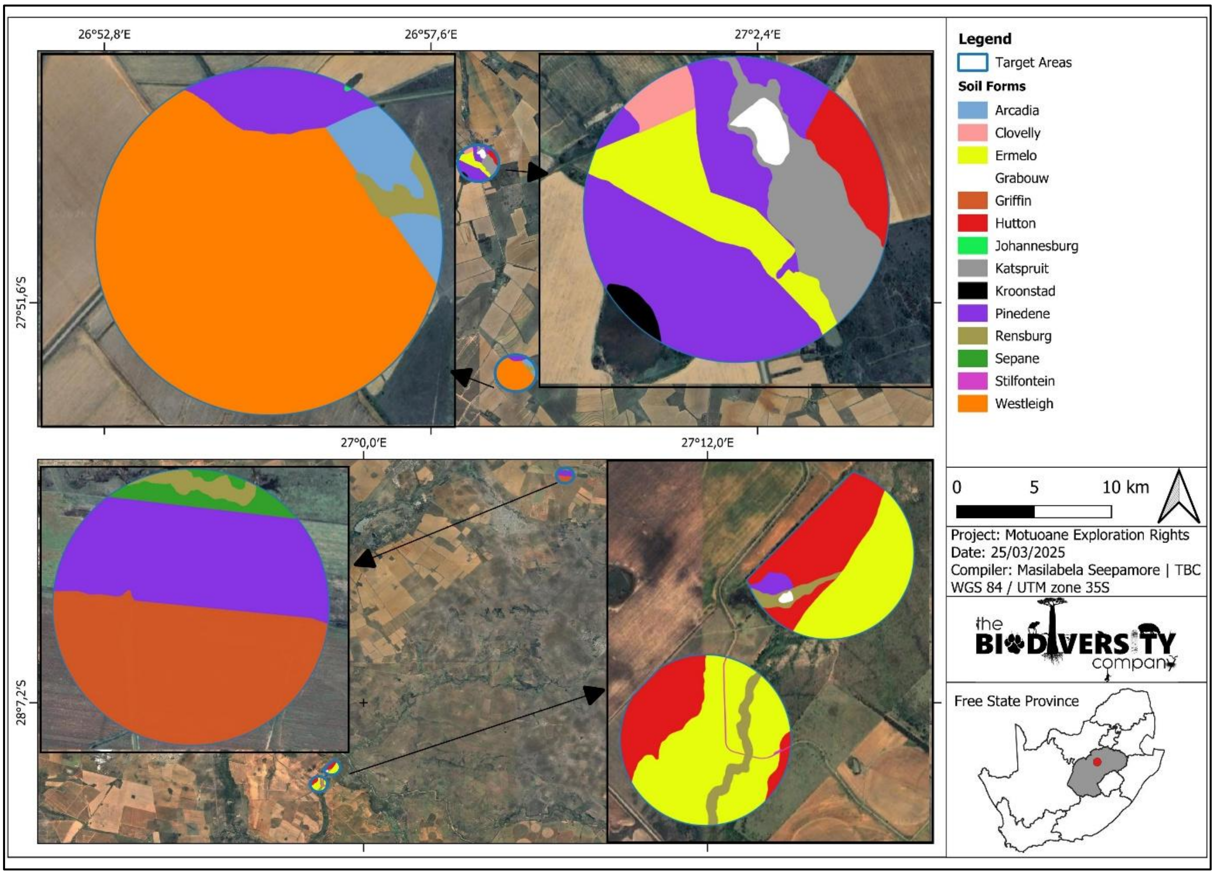


Figure 4-1 Soil forms found within the proposed project area

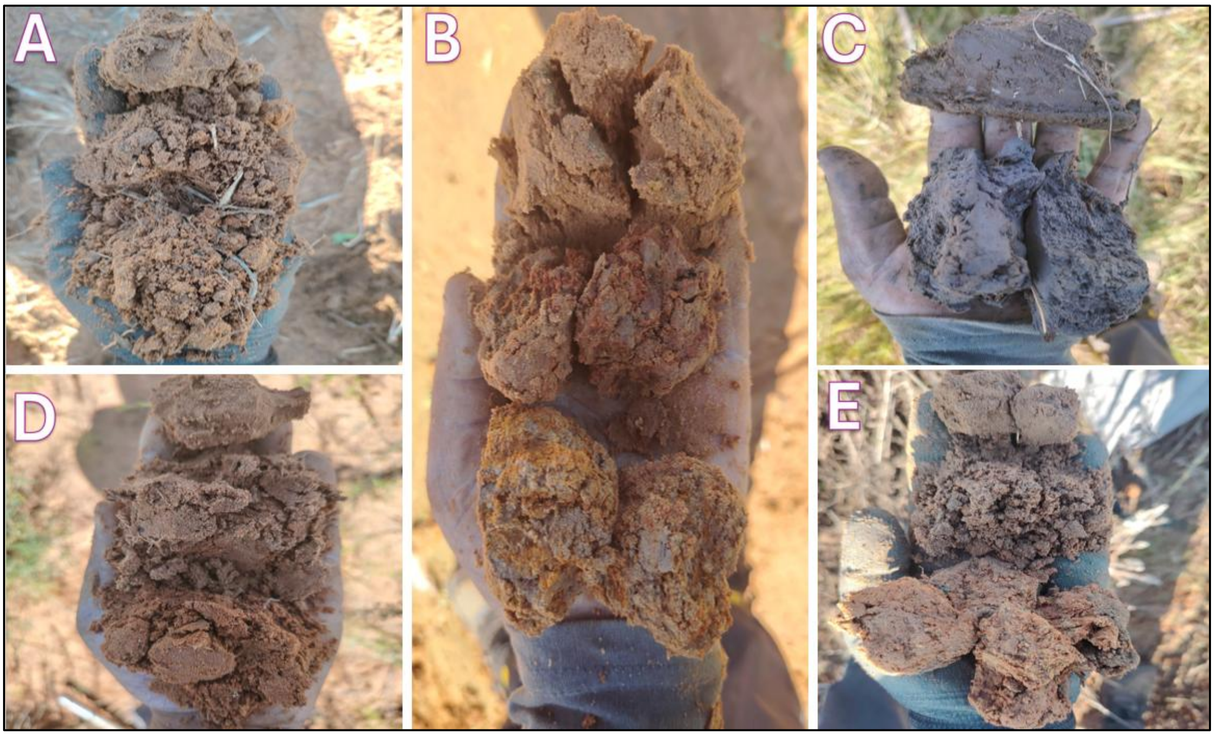


Figure 4-2 ***Diagnostic soil horizons identified on-site: A) Clovelly soil form; B) Westleigh soil form; C) Rensburg soil form; D) Griffin soil form; and E) Pinedene soil form.***

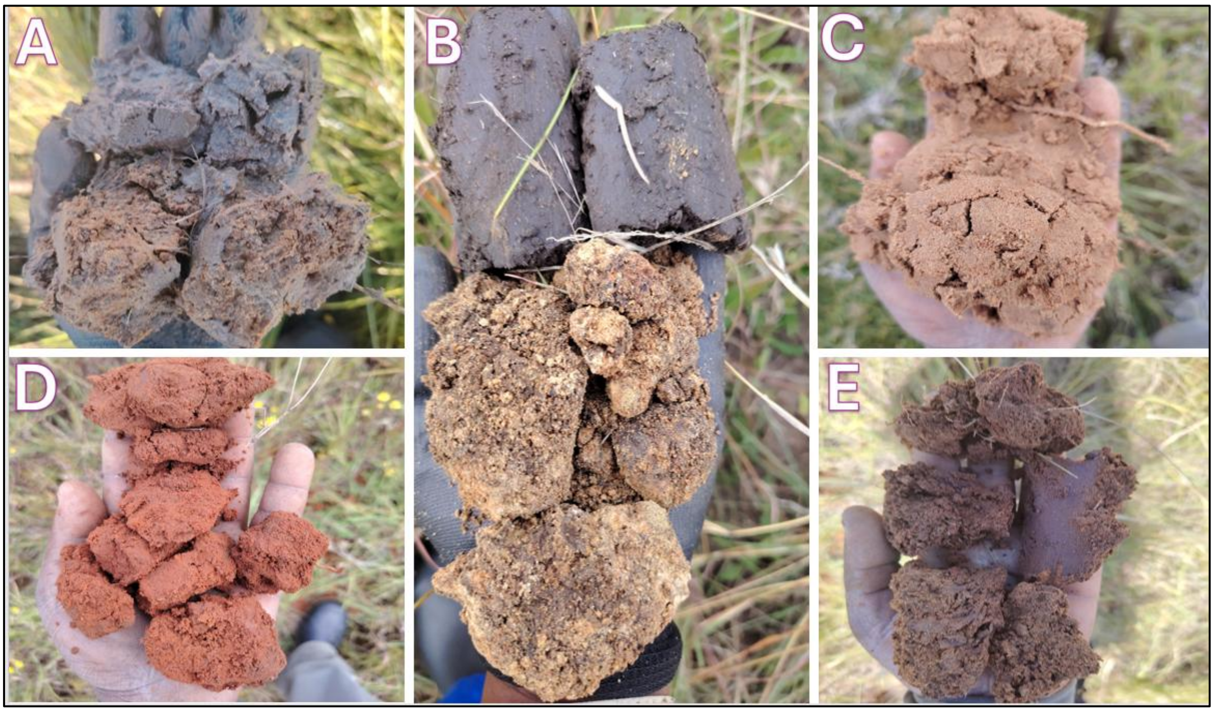


Figure 4-3 ***Diagnostic soil horizons identified on-site: A) Albic over gley subsurface horizons ; B) Arcadia soil form; C) Ermelo soil form; D) Hutton soil form; and E) Sepane soil form.***

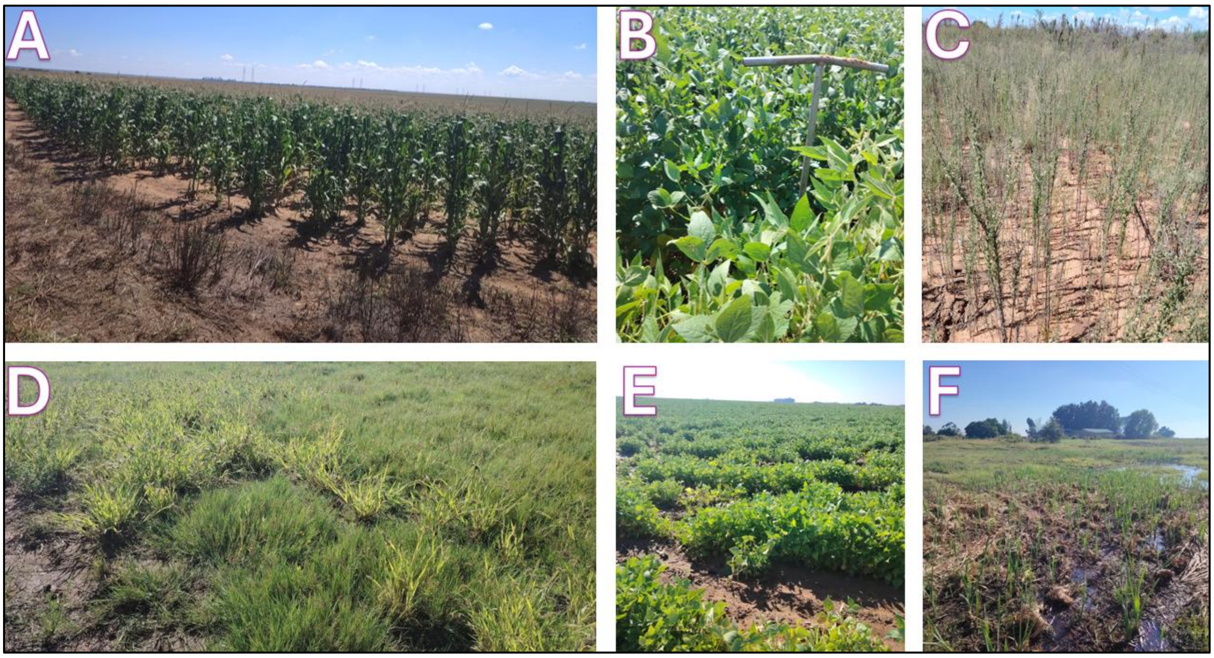


Figure 4-4 Current land use found within the proposed seismic survey drilling areas; A); B) & E) Active crop fields; C) historical crop fields; D) Common vegetation; and F) Wetland.

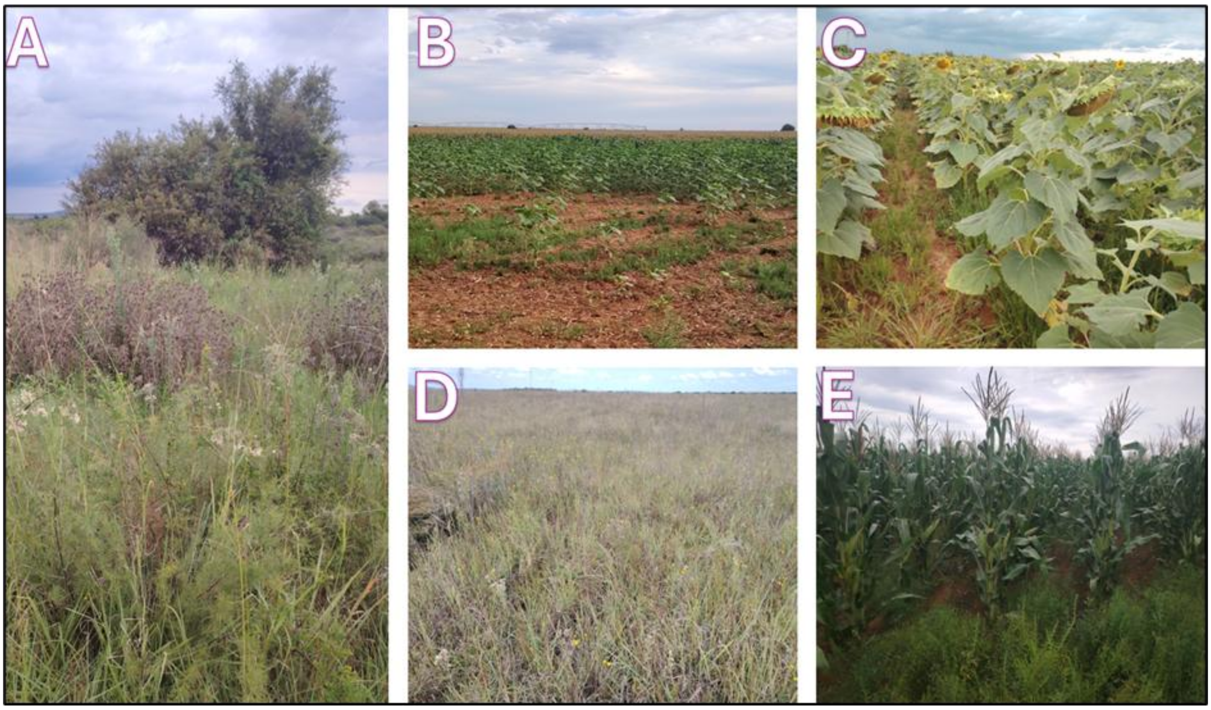


Figure 4-5 Current land use found within the proposed project area ; A); B) & E) Active crop fields; C) historical crop fields; D) Common vegetation; and F) Wetland.

4.4 Agricultural Potential

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

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

4.4.1 Climate Capability

The climatic capability has been determined by means of the Smith (2006) methodology, of which the first step includes determining the climate capability of the region by means of the Mean Annual Precipitation (MAP) and annual Class A pan (potential evaporation) (see Table 4 -3Table 4 -3).

Table 4 -3 Climate capability (step 1; Scotney et al., 1987)

Central Sandy Bushveld region				
Climatic Capability Class	**Limitation Rating**	**Description**	**MAP: Class A pan Class**	**Applicability to site**
C1	None to Slight	Local climate is favourable for good yields for a wide range of adapted crops throughout the year.	0.75-1.00	
C2	Slight	Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperature increase risk, and decrease yields relative to C1.	0.50-0.75	
C3	Slight to Moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.	0.47-0.50	
C4	Moderate	Moderately restricted growing season due to the occurrence of low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.	0.44-0.47	
C5	Moderate to Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss.	0.41-0.44	
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss.	0.38-0.41	
C7	Severe to Very Severe	Severely restricted choice of crops due to heat and moisture stress.	0.34-0.38	
C8	Very Severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.	0.30-0.34	✔

According to Smith (2006), the climatic capability of a region is only refined past the first step if the climatic capability is determined to be between climatic capability 1 and 6. Given the fact that the climatic capability (i.e. Vaal-Vet Sandy Grassland and Windburg Grassy Shrubland , MAP 530 and 495 mm and MAPE of 2423 and 2273 mm with a MAP: A pan Class of 0.22, respectively. The Central Free State Sandy Grassland and Highveld Alluvial Vegetation, MAP 562 and 495 mm, MAPE od 2226 and 2507 mm, with a MAP: A pan Class of 0.25 and 0.20, respectively) has been determined to be "C8" for the project area.

4.4.2 Land Capability

The land capability was determined by using the guidelines described in "The farming handbook" (Smith, 2006). The delineated soil forms were clipped into the four different slope classes (0-5%, 5-10%,10-15% and 15-20%) to determine the land capability of each soil form. Accordingly, the most sensitive soil forms associated with the project area are restricted to land capability "I" (i.e. maize and soyabean cultivation), land capability "II" (i.e. Ermelo, Clovelly, Griffin, Hutton, Pinedene and Westleigh soil forms), land capability “III” (i.e. Sepane and Arcadia soil forms), land capability “V” (i.e. Katspruit, Kroonstad and Rensburg soil forms) and land capability “VIII” (i.e. Johannesburg, Stilfontein and Grabouw soil forms).

Land capability is defined as the combination of the slope class and soil morphological properties (i.e. topsoil texture, profile depth and permeability class of the upper soil layers). Accordingly, following Smith, (2006) which the national DAFF, (2017) land capabilities protocols were further expanded from, the above-mentioned identified soil forms associated with active cropping is restricted to land capability class “I” (i.e. Maize and soyabeans) categorised by LC 8-10 (Moderate to Moderate-High), land capability classes “II” (i.e. Ermelo, Clovelly, Griffin, Hutton, Pinedene and Westleigh soil form) categorised by LC 6-7 (Low-Moderate); land capability “III” (i.e. Sepane and Arcadia soil forms) categorised by LC 1-5 (Very Low to Low), land capability “V” (i.e. Katspruit, Kroonstad and Rensburg soil forms) categorised by LC 6-7 (Low-Moderate), and land capability “VIII” (i.e. Johannesburg, Stilfontein and Grabouw soil forms) categorized by LC 1-5 (Very Low to Low). The baseline soil land capability was aligned and - compared to the National Land Capability data (DAFF, 2017).

Table 4-4 Land capability for the soils within the project area

Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Land Capability Group	Sensitivity
I	No or few limitations. Very high arable potential. Very low erosion hazard.	Good agronomic practice.	Annual cropping.	Arable	High
II	Slight limitations. High arable potential. Low erosion hazard.	Adequate run-off control.	Annual cropping with special tillage or ley (25%).	Arable	Medium
III	Moderate limitations. Some erosion hazard.	Special conservation practices and tillage methods.	Rotation of crops and ley (50%)	Arable	Medium
IV	Severe limitations. Low arable potential. High erosion hazard.	Intensive conservation practice.	Long-term leys (75%)	Arable	Medium
V	Water course and land with wetness limitations.	Protection and control of water table.	Improved pastures, suitable for wildlife	Arable	Medium
VI	Limitations preclude cultivation. Suitable for perennial vegetation.	Protection measures for establishment, e.g., sod-seeding	Veld, pasture, and afforestation.	Non-Arable	Low

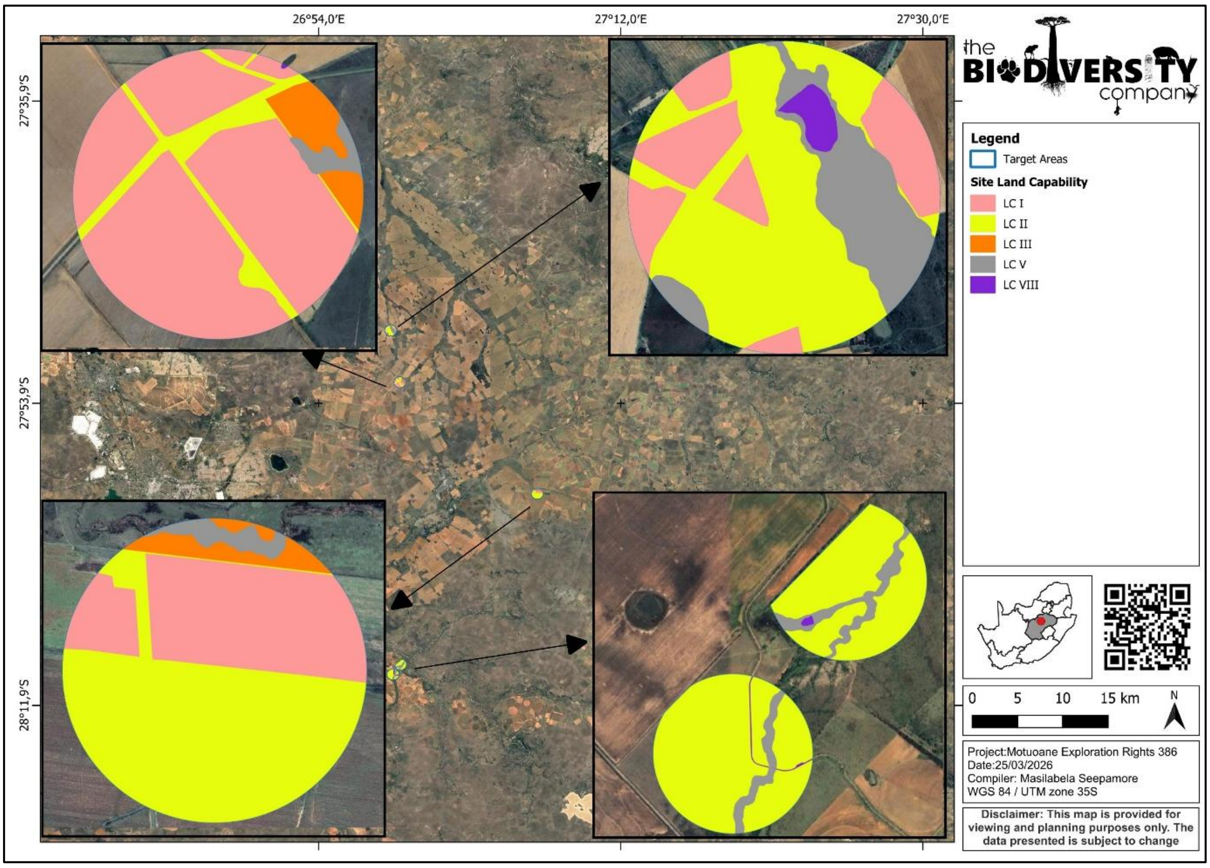


Figure 4-6 ***Site land capability of the dominant soil forms identified in the proposed project area***

4.4.3 Land Potential

The land potential was determined to further verify the land capability to the National Land Capability data (DAFF, 2017). The methodology in regard to the calculations of the relevant land potential levels are illustrated in Table 4-5 and Table 4-7.

From the three land capability classes, the land potential levels have been determined by means of the Guy and Smith (1998) methodology. The land capability class "I" is equivalent to land potential 4, land capability "II" is equivalent to land potential 5, land capability class "III" were equivalent to a land potential level 6, land capability class V to Vlei, and land capability "VIII" to land potential 8 due to available climatic conditions. Areas under grain production are categorised with a land potential 4. The categorized land potentials for the site identified soil forms are illustrated in Table 4-6 below.

Table 4-5 ***Land potential from climate capability vs land capability (Guy and Smith, 1998)***

Land Capability Class	Climatic Capability Class							
	C1	C2	C3	C4	C5	C6	C7	C8
LC1	L1	L1	L2	L2	L3	L3	L4	L4*
LC2	L1	L2	L2	L3	L3	L4	L4	L5*
LC3	L2	L2	L2	L2	L4	L4	L5	L6*
LC4	L2	L3	L3	L4	L4	L5	L5	L6
LC5	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei*
LC6	L4	L4	L5	L5	L5	L6	L6	L7

LC7	L5	L5	L6	L6	L7	L7	L7	L8
LC8	L6	L6	L7	L7	L8	L8	L8	L8*

*Land potential level applicable to the climate and land capability

Table 4-6 Land potential categories for the soil forms identified in the project area

Soil Form/Family	Land Potential
Maize and Soyabeans cultivation	4
Ermelo, Clovelly, Griffin, Hutton, Pinedene and Westleigh soil forms	5
Sepane and Arcadia soil forms	6
Katspruit, Kroonstad and Rensburg soil forms	Vlei
Johannesburg, Stilfontein and Grabouw	8

Table 4-7 Land potential for the soils within the project area (Guy and Smith, 1998)

Land Potential	Description of Land Potential Class	Sensitivity
4	Moderate potential. Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.	High
5	Restricted potential. Regular and/or moderate to severe limitations due to soil, slope temperatures or rainfall.	Medium
6	Very restricted potential. Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable.	Low
8	Very low potential. Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable.	Low
Vlei	-	Medium
Disturbed	N/A	None

Figure 4-7 Site land potential of the dominant soil forms identified in the proposed project area

4.4.4 Erosion Potential

The erosion potential of the identified soil forms has been calculated by means of Soil Loss Estimator for Southern Africa (SLEMSA) methodology described in Smith (2006). In some cases, none of the parameters are applicable, in which case the step was skipped.

4.4.4.1 Ermelo

Table 4-8 illustrates the values relevant to the erosion potential of the Ermelo soil forms. The final erosion potential score has been calculated at 4, which indicates a "Moderate" potential for erosion.

Table 4-8 Erosion potential calculation for the Ermelo soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 / 4.0	4.5 / 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.4.4.2 Griffin

Table 4-9 illustrates the values relevant to the erosion potential of the Griffin soil forms. The final erosion potential score has been calculated at 4, which indicates a "Moderate" potential for erosion.

Table 4-9 Erosion potential calculation for the Griffin soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 / 4.0	4.5 / 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		

Dystrophic Soils, Medium and Heavy Textures	Mesotrophic Soils	Eutrophic or Calcareous Soils, Medium and Heavy Textures
+0.5	0	-0.5
	Step 4- Organic Matter	
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
	Step 5- Topsoil Limitations	
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
	Step 6- Effective Soil Depth	
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.4.4.3 Hutton

Table 4-10 illustrates the values relevant to the erosion potential of the Hutton soil forms. The final erosion potential score has been calculated at 4, which indicates a “Moderate” potential for erosion.

Table 4-10 Erosion potential calculation for the Hutton soil form

	Step 1- Initial Value, Texture of Topsoil	
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5	4.0 4.5 5.0	6.0
	Step 2- Adjustment Value (Permeability of Subsoil)	
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
	Step 3- Degree of Leaching (Excluding Bottomlands)	
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
	Step 4- Organic Matter	
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
	Step 5- Topsoil Limitations	
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
	Step 6- Effective Soil Depth	
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.4.4.4 Clovelly

Table 4-11illustrates the values relevant to the erosion potential of the Clovelly soil forms. The final erosion potential score has been calculated at 4, which indicates a “Moderate” potential for erosion.

Table 4-11 Erosion potential calculation for the Clovelly soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 4.0	4.5 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.4.4.5 Pinedene

Table 4-12 illustrates the values relevant to the erosion potential of the Pinedene soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "Moderate" potential for erosion.

Table 4-12 Erosion potential calculation for the Pinedene soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 4.0	4.5 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**

-0.5	-0.5
Step 6- Effective Soil Depth	
Very Shallow (<250 mm)	**Shallow (<250-500 mm)**
-1.0	-0.5

4.4.4.6 Westleigh

Table 4-13 illustrates the values relevant to the erosion potential of the Westleigh soil forms. The final erosion potential score has been calculated at 3.5, which indicates a “Moderate” potential for erosion

Table 4-13 Erosion potential calculation for the Westleigh soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 **4.0**	4.5 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	**0**	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.4.4.7 Katspruit

Table 4-14 illustrates the values relevant to the erosion potential of the Katspruit soil forms. The final erosion potential score has been calculated at 2.5, which indicates a “High” potential for erosion.

Table 4-14 Erosion potential calculation for the Katspruit soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 **4.0**	4.5 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	**-2.0**
Step 3- Degree of Leaching (Excluding Bottomlands)		

Dystrophic Soils, Medium and Heavy Textures	Mesotrophic Soils	Eutrophic or Calcareous Soils, Medium and Heavy Textures
+0.5	0	-0.5
	Step 4- Organic Matter	
Organic Topsoil		Humic Topsoil
+0.5		+0.5
	Step 5- Topsoil Limitations	
Surface Crusting		Excessive Sand/High Shrink/Self-Mulching
-0.5		-0.5
	Step 6- Effective Soil Depth	
Very Shallow (<250 mm)		Shallow (<250-500 mm)
-1.0		-0.5

4.4.4.8 Kroonstad

Table 4-15 illustrates the values relevant to the erosion potential of the Kroonstad soil forms. The final erosion potential score has been calculated at 4.0, which indicates a "Moderate" potential for erosion.

Table 4-15 Erosion potential calculation for the Kroonstad soil form

	Step 1- Initial Value, Texture of Topsoil	
Light (0-15% Clay)	Medium (15-35% Clay)	Heavy (>35% Clay)
3.5	4.0 4.5 5.0	6.0
	Step 2- Adjustment Value (Permeability of Subsoil)	
Slightly Restricted	Moderately Restricted	Heavily Restricted
-0.5	-1.0	-2.0
	Step 3- Degree of Leaching (Excluding Bottomlands)	
Dystrophic Soils, Medium and Heavy Textures	Mesotrophic Soils	Eutrophic or Calcareous Soils, Medium and Heavy Textures
+0.5	0	-0.5
	Step 4- Organic Matter	
Organic Topsoil		Humic Topsoil
+0.5		+0.5
	Step 5- Topsoil Limitations	
Surface Crusting		Excessive Sand/High Shrink/Self-Mulching
-0.5		-0.5
	Step 6- Effective Soil Depth	
Very Shallow (<250 mm)		Shallow (<250-500 mm)
-1.0		-0.5

4.4.4.9 Resburg

illustrates the values relevant to the erosion potential of the Rensburg soil forms. The final erosion potential score has been calculated at 4.5, which indicates a "Moderate" potential for erosion

Table 4-16 Erosion potential calculation for the Rensburg soil form

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		Medium (15-35% Clay)		Heavy (>35% Clay)
3.5	4.0	4.5	5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		Moderately Restricted		Heavily Restricted
-0.5		-1.0		**-2.0**
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		Mesotrophic Soils		Eutrophic or Calcareous Soils, Medium and Heavy Textures
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			Humic Topsoil	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			Excessive Sand/High Shrink/Self-Mulching	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			Shallow (<250-500 mm)	
-1.0			-0.5	

4.4.4.10 Sepane

Table 4-17 illustrates the values relevant to the erosion potential of the Sepane soil forms. The final erosion potential score has been calculated at 2.5, which indicates a “high” potential for erosion.

Table 4-17 Erosion potential calculation for the Sepane soil form

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		Medium (15-35% Clay)		Heavy (>35% Clay)
3.5	**4.0**	4.5	5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		Moderately Restricted		Heavily Restricted
-0.5		-1.0		**-2.0**
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		Mesotrophic Soils		Eutrophic or Calcareous Soils, Medium and Heavy Textures
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			Humic Topsoil	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			Excessive Sand/High Shrink/Self-Mulching	

-0.5	-0.5
Step 6- Effective Soil Depth	
Very Shallow (<250 mm)	**Shallow (<250-500 mm)**
-1.0	**-0.5**

4.4.4.11 Arcadia

Table 4-18 illustrates the values relevant to the erosion potential of the Arcadia soil forms. The final erosion potential score has been calculated at 2.0, which indicates a “high” potential for erosion.

Table 4-18 Erosion potential calculation for the Arcadia soil form

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5	4.0 4.5 5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	**-2.0**
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		**-0.5**

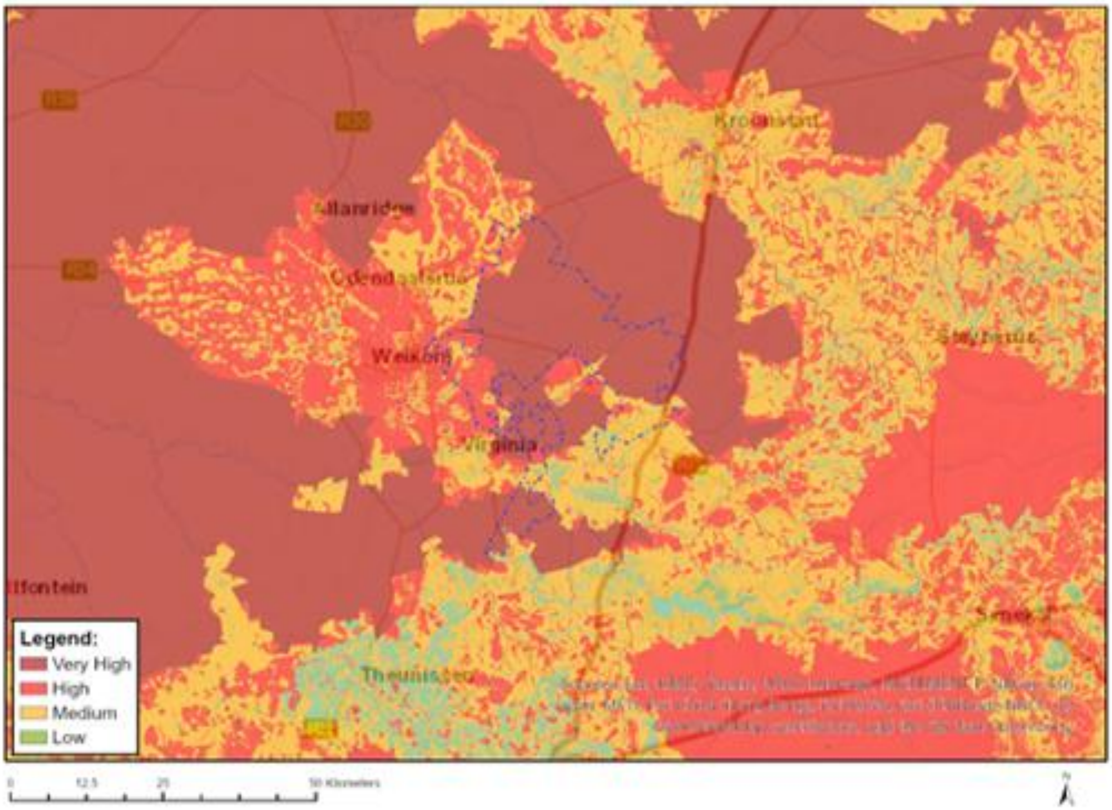
4.5 Sensitivity Verification

4.5.1 Screening Report – Motuoane Exploration Right 386 Application

The following is deduced from the National Web-based Environmental Screening Tool Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Agriculture Theme Sensitivity indicates that the 50 m buffer area of the proposed project area falls within the “Medium to High” agricultural sensitivity (Figure 4-8).

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Old_Fields
High	Rainfed Annual Crop Cultivation / Planted Pastures
High	Shadenet
High	Small_Holdings
High	09. Moderate-High
High	08. Moderate
Low	05. Low
Medium	06. Low-Moderate
Medium	07. Low-Moderate
Very High	Horticulture

Very High	Non-pivot Irrigated Annual Crop Cultivation / Planted Pastures
Very High	Pivot_Irrigation
Very High	Welkom-Hennenman PAA
Very High	Virginia PAA

Figure 4-8 Map of Relative Agricultural Theme Sensitivity for theMotuoane Exploration Right 386 Application generated by the Environmental Screening Tool

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which five potential land capability classes are located within the site verified proposed seismic survey drilling areas, including;

- Land Capability 5 (Very Low to Low Sensitivity);
- Land Capability 6 to 7 (Low-Moderate Sensitivity); and
- Land Capability 8 to 9 (Moderate to Moderate-High Sensitivity).

Moreover, fifteen land capability have been digested by (DAFF, 2017) across South Africa, of which seven potential land capability classes are located within the 50 m Buffer area of the entire seismic right assessment area, including;

- Land Capability 3 to 5 (Very Low to Low Sensitivity);
- Land Capability 6 to 7 (Low-Moderate Sensitivity); and
- Land Capability 8 to 9 (Moderate to Moderate-High Sensitivity).

The land capability dataset (DAFF, 2017) indicates that the proposed target areas (seismic survey and drilling areas) falls predominately with “Low-Moderate” and “Moderate to Moderate-High” sensitivities and with marginal areas have “Very Low to Low” sensitivity (see Figure 4-9 and Figure 4-10). Furthermore, the agricultural theme tool also indicated the presence of highly sensitive field crop boundaries within the target areas, and high to very high sensitive field crop boundaries within the 50 m buffer area of the entire seismic right assessment area (Figure 4-11 and Figure 4-12).). Moreover, all the proposed target areas together with the majority of the assessed area of the proposed exploration right area, falls within Protected Agricultural Areas (PAAs), as stipulated by the DALRRD (2020; Figure 4-13).

The baseline soil findings, current land uses and the calculated land potential concur to an extent with the agricultural theme tool, in areas demarcated “Low-Moderate” and “Very Low to Low” land capability sensitivities and with highly sensitive field crop boundaries within target drilling areas. They further dispute to an extent the agricultural theme tool on all areas demarcated as highly sensitive for field crop boundaries and “Moderate to Moderate-High” land capability sensitivity. Commercial maize and soyabean production under rainfed conditions were confirmed within the target drilling areas alongside historical crop fields. It is worth noting that the proposed drilling within the target areas will have a minor footprint (50 × 50 m) and therefore, is expected to have a negligible impact of soil and agricultural resources of the area.

Moreover, low and medium potential soils were identified within the target areas. According to the Land Type Survey Staff (1972 – 2006), low, medium and moderate potential soils were confirmed within the entire exploration right area. Moreover, highly and very highly sensitive field crop boundaries were identified within the 50 m buffer area of entire seismic right assessment area.

The current project area (drilling sites) and associated activities of the proposed project will have acceptable expected changes to soil resources. As a result, based on the verified baseline findings, the proposed development will have a minimal impact on the soil resources.

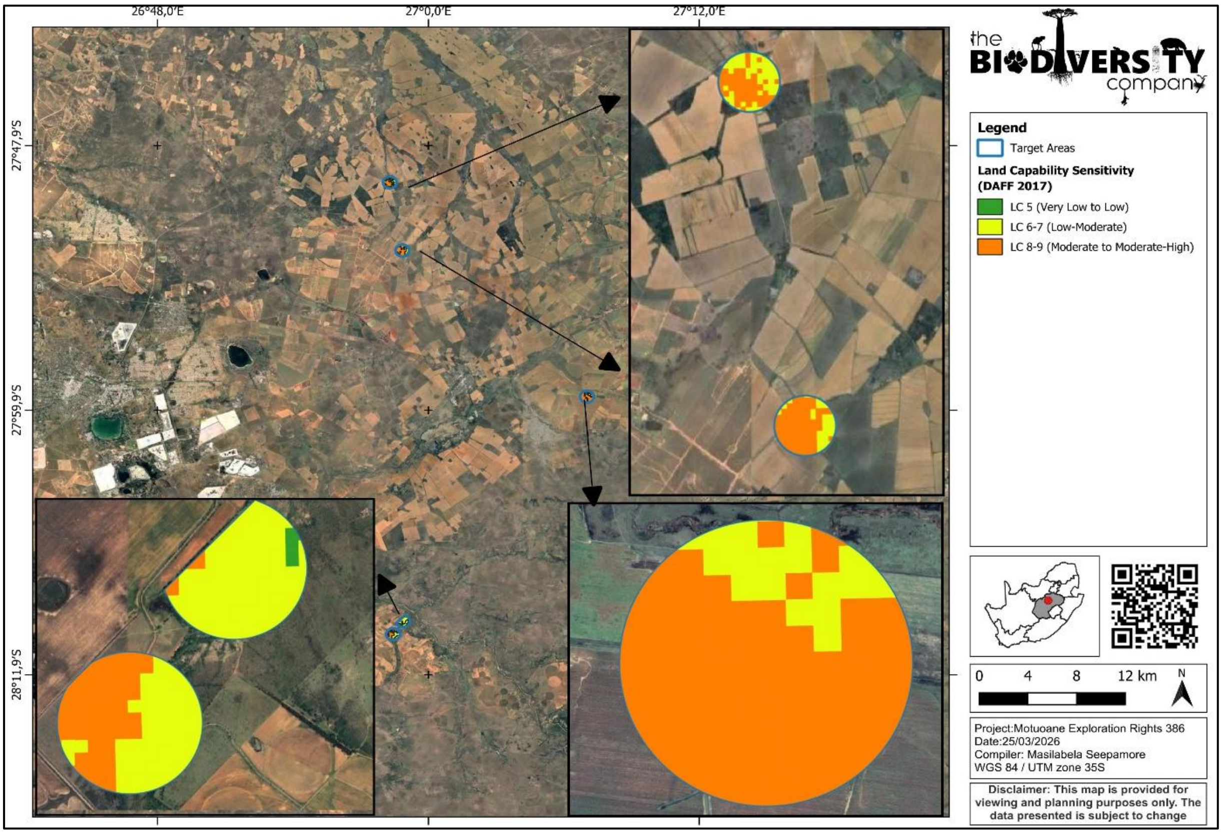


Figure 4-9 Land Capability Sensitivity (DAFF, 2017) for the target areas

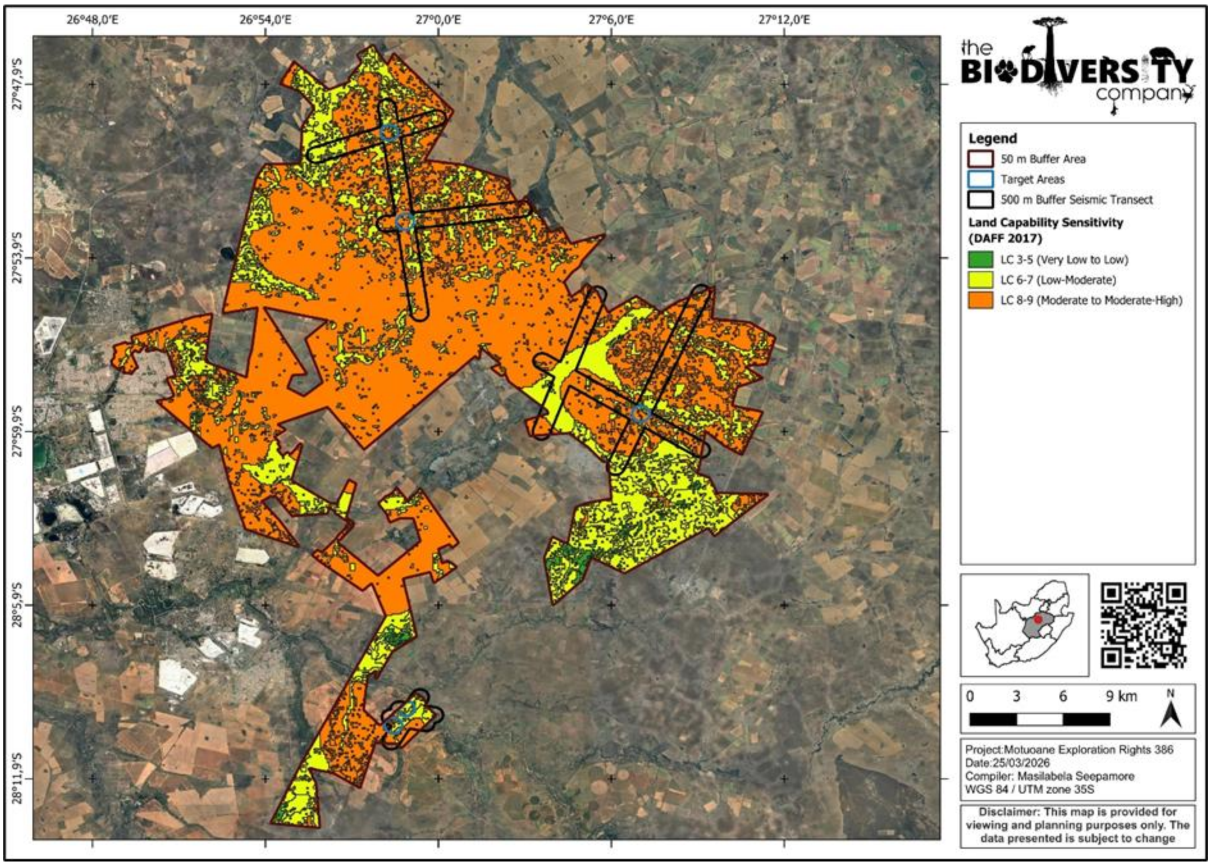


Figure 4-10 Land Capability Sensitivity (DAFF, 2017) for the 50 m buffer area of the entire seismic right assessment area

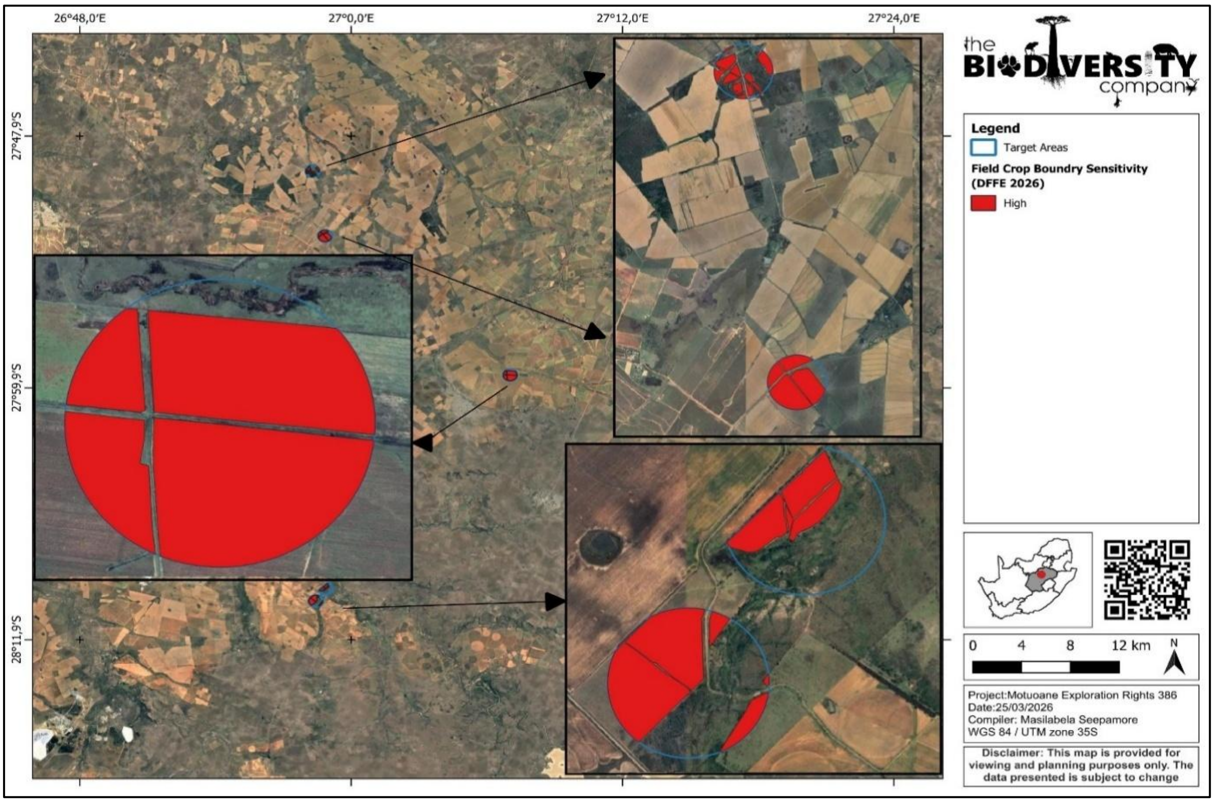


Figure 4-11 Field crop boundary sensitivity (DFFE 2026) target areas

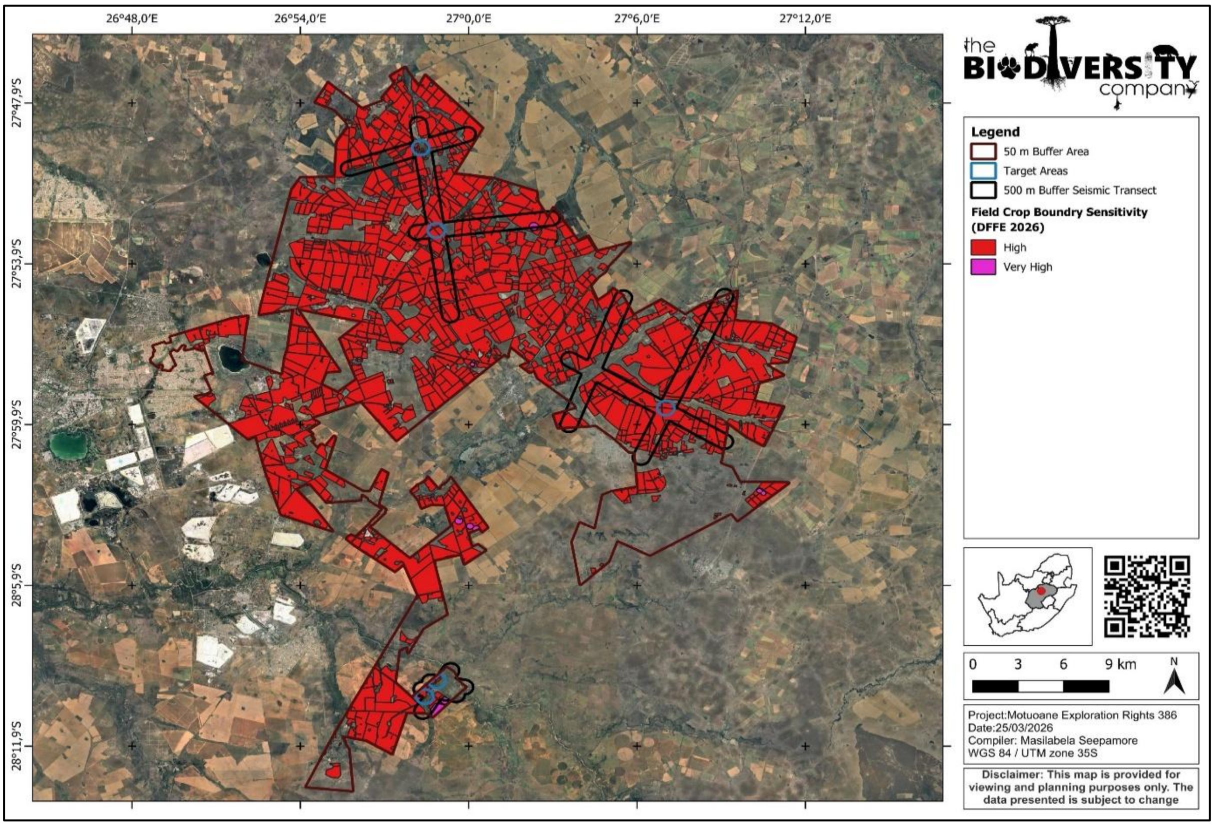


Figure 4-12 Field crop boundary sensitivity (DFFE 2026) for the 50 m buffer area of the entire seismic right assessment area

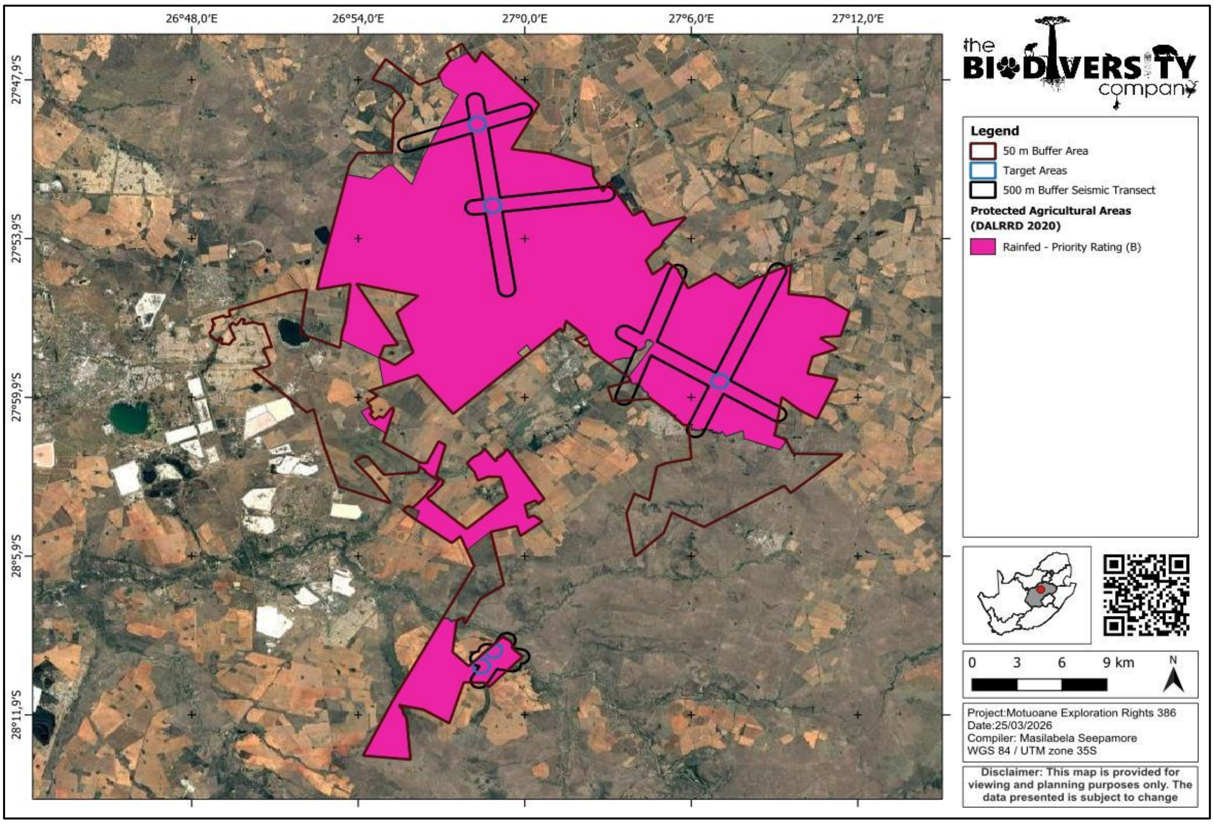


Figure 4-13 Protected Agricultural Areas (DALRRD, 2020)

4.5.2 Site Ecological Importance (SEI)

The following land potential levels have been determined:

- Land potential level 4 (this land potential level is characterised by moderate potential. Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land. Arable soils);
- Land potential level 5 (this land potential level is characterised by restricted potential. Regular and/or moderate to severe limitations due to soil, slope, temperatures or rainfall. Arable);
- Land potential level 6 (this land potential level is characterised by a very restricted potential. Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable);
- Land potential level 8 (this land potential level is characterised by very low potential. Very severe limitation due to soil, slope, temperatures or rainfall. Non-arable); and
- Vlei

The climatic conditions, soil forms, land use and land capability features were used to determine the overall sensitivity of the soil resources. The land capability level "I" areas were scored a "High" sensitivity, land capabilities "II" and "Vlei" were assigned "Medium" sensitivity. Land capabilities "III" and "VIII" was assigned "Low" sensitivity. (Figure 4-14).

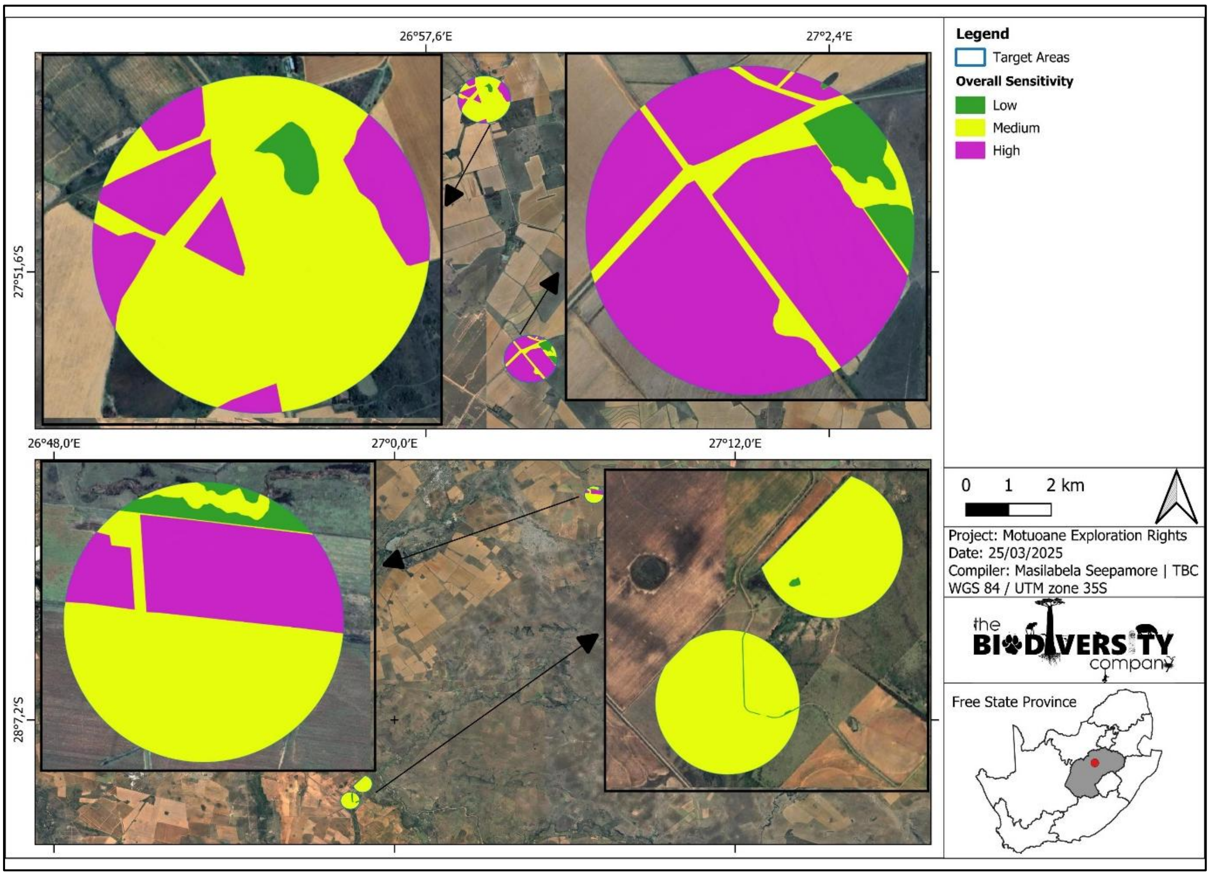


Figure 4-14 Overall sensitivity for the proposed project area

Considering the soil properties, agricultural potential as well as the current land use of the proposed target drilling areas, the area has a predominately "Medium" agricultural sensitivity, with "High" and marginal "Low" sensitive areas (see Figure 4-14). The allocated sensitivities for the theme are either disputed or validated in Table 4-19 below.

Table 4-19 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Theme	Feature	Screening Tool	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Agricultural Theme	Virginia & Welkom-Hennenman PAA	Very High	Very High	Validated – High to Very High land capability. The presence of maize cultivation under pivot irrigation infrastructure within the assessed area of the proposed project area.
	Virginia & Welkom-Hennenman PAA	Very High	High	Disputed – Moderate to Moderate-High capability. The presence of maize and soya beans cultivation under rainfed conditions in target areas and seismic transects area of the proposed project area.
	Virginia & Welkom-Hennenman PAA	Very High	Medium	Disputed – Low-Moderate land capability. The absence of active cropping either rainfed or under irrigation infrastructure. Moreover, the presence of medium potential soils such as Ermelo, Griffin, Hutton, Clovelly, Pinedene, Westleigh soil forms. Moreover, the presences of hydromorphic soils with signs of wetness such as Katspruit, Kroonstad and Rensburg soil forms.
	Virginia & Welkom-Hennenman PAA	Very High	Low	Disputed – Very Low to Low. The absence of active cropping either rainfed or under irrigation infrastructure. Moreover, the presence of low potential soils such as Sepane and Arcadia may require irrigation to enhance their productivity. Additionally, the presence of anthropogenic soil materials such as Johannesburg, Grabouw and Stilfontein.
	Pivo Irrigation	Very High	Very High	Validated – High to Very High land capability. The presence of maize cultivation under pivot irrigation infrastructure within the assessed area of the proposed project area.
	Pivot Irrigation	Very High	High	Disputed - Moderate to Moderate-High capability. The presence of maize and soya beans cultivation under rainfed conditions in target areas and seismic transects area of the proposed project area.
	Horticulture	Very High	Very High	Could not be verified – Lack of access
	Rainfed Annual Crop Cultivation / Planted Pastures	High	High	Validated – Moderate to Moderate-High capability. The presence of maize and soya beans cultivation under rainfed conditions in assessed area.
	Rainfed Annual Crop Cultivation / Planted Pastures	High	Medium	Disputed - Low-Moderate land capability. The presence of historical crop fields on medium potential soils such as Griffin and Pinedene soil forms.
	Rainfed Annual Crop Cultivation / Planted Pastures	High	Low	Disputed – Very Low to Low land capability. The presence of historical crop fields on low potential soils such as Arcadia, Sepane and Johannesburg soil forms.
	Small Holding	High	High	Validated/Disputed – Lack of access.
	Small Holding	High	High	Disputed - Moderate to Moderate-High land capability. The absence of small holding crop cultivation. However, the presence of commercial maize and soya beans production under rainfed conditions.
	Old Fields	High	High	Could not be verified – Lack of access.
	Old Fields	High	High	Disputed - The presence of maize and soya beans cultivation under rainfed conditions in target areas and seismic transects area.
	Old Fields	High	Medium	Disputed - Low-Moderate land capability. The presence of historical crop fields on medium potential soils such as Griffin and Pinedene soil forms.
	Old Fields	High	Low	Disputed - Very Low to Low land capability. The presence of historical crop fields on low potential soils such as Arcadia, Sepane and Johannesburg soil forms.
	Moderate to Moderate-High (LC 8-9)	High	Medium	Disputed – Low-Moderate land capability. The presence of medium potential such as Ermelo, Griffin, Hutton, Clovelly, Pinedene, Westleigh soil forms. Moreover, the presences of hydromorphic

			soils with signs of wetness such as Katspruit, Kroonstad and Rensburg soil forms.
Moderate to Moderate-High (LC 8-9)	**High**	**Low**	Disputed – Very Low to Low land capability. The presence of low potential soils such as Sepane and Arcadia soil forms. Additionally, the presence of anthropogenic soil materials such as Johannesburg, Grabouw and Stilfontein.
Low-Moderate (LC 6-7)	**Medium**	**Medium**	Validated - Low-Moderate land capability. The presence of medium potential such as Ermelo, Griffin, Hutton, Clovelly, Pinedene, Westleigh soil forms. Moreover, the presence of hydromorphic soils with signs of wetness such as Katspruit, Kroonstad and Rensburg soil forms.
Low-Moderate (LC 6-7)	**Medium**	**Low**	Disputed – Very Low to Low land capability. The presence of low potential soils such as Sepane and Arcadia soil forms. Additionally, the presence of anthropogenic soil materials such as Johannesburg, Grabouw and Stilfontein.
Very Low to Low (LC 3-5)	**Low**	**Medium**	Disputed – Low-Moderate land capability. The presence of medium potential such as Ermelo, Griffin, Hutton, Clovelly, Pinedene, Westleigh soil forms. Moreover, the presence of hydromorphic soils with signs of wetness such as Katspruit, Kroonstad and Rensburg soil forms.
Very Low to Low (LC 3-5)	**Low**	**Low**	Validated - Very Low to Low land capability. The presence of low potential soils such as Sepane and Arcadia soil forms. Additionally, the presence of anthropogenic soil materials such as Johannesburg, Grabouw and Stilfontein.

5 Impact Assessment

Potential impacts were assessed to identify relevance to the proposed target drilling areas to available soils resources. The relevant impacts were determined following the prescribed EIMS impact assessment methodology.

5.1 Planning Phase Impacts

Involves a series of steps to ready the site for exploration activities including obtaining necessary licenses / permits, review of available information, identifying existing blowers, determination of final drilling sites, and undertaking additional consultation i.e., landowner agreements. This phase will also involve the undertaking of an asset and services baseline register within 50 m of the affected exploration site, pre-drilling survey, compilation of emergency response plans, acquisition and training of relevant personnel.

Ancillary Activities:

- I&AP Consultation;
- Landowner agreements;
- Developing emergency plans to address potential accidents or incidents, such as drilling equipment failures or spills;
- Ensuring access to power and water sources if needed;
- Installing warning signs and fencing to protect the area and prevent unauthorized access;
- Comprehensive safety and environmental awareness training for all personnel; and
- Establishing and maintaining effective communication/grievance systems between the exploration crew, landowners and community members.

5.2 Construction Phase

5.2.1 Construction Phase: Earthworks

This phase will involve the initial groundwork required to prepare the sites exploration activities. Activities which include site clearing, grading, excavating, moving, and compacting soil and rock to create access roads (where necessary), temporary site camp for seismic survey team and the 50 m x 50 m drilling pads will be done. The following will be done;

Ancillary Activities:

- Stripping and stockpiling of soils
- Levelling, grubbing and bulldozing
- Removing vegetation, trees, and shrubs to create a clear drilling / exploration area
- Preparing trenches and foundations
- Establishment of drilling pads to provide a stable base for the drill rig
- Constructing of temporary gravel access roads or improving existing access roads to allow for the transportation of equipment and personnel to the drilling site
- Setting up site camps for drilling and seismic team and vehicles
- Setting up systems for managing drilling fluids, which may include containment sumps

5.2.2 Construction Phase: Exploration

This phase involves the undertaking of the actual seismic transects and exploration drilling. It will involve the traversing by the Vibroesis truck / AWD / Magnetotelluric along the seismic transects to obtain the seismic information and the exploration drilling at the final drilling site/s.

Ancillary Activities:

- Seismic surveys
- Drilling activities
- Collecting, storing, and transporting drill core samples
- Collecting, storing, and disposing of drilling waste, including cuttings, fluids, and debris
- Surface and groundwater water management

The proposed development will result in the stripping of topsoil and alterations to the existing land uses. The changes in the land use will be from agricultural and natural practices to gas drilling sites. The proposed activities will impact on areas expected to be of low to high potential. It is possible that suitable agricultural land could become fragmented, resulting in these smaller portions no longer being deemed feasible to farming practices.

During the construction phase, foundations will be cleared with topsoil often being stripped and stockpiled. Access roads will be created with trenches being dug for the installation of relevant drilling pads. Potential erosion is expected during the construction phase due to moderate and high erodibility of the soils within the footprint assessment area. The removal of vegetation and changes to the local topography could result in an alteration to surface run-off dynamics. Erosion of the area could result in further loss of topsoil, and soil forms suitable for agriculture. Soil compaction can also result due to increased traffic on site. Possible soil contamination from spills and leaks of hydrocarbons, chemicals and produced water from increased traffic and gas drilling activities.

Table 5-1 Impact assessment related to the loss of land capability during the construction phase of the Motuoane Exploration Right 386 project

ID: SoilA1	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
Impact: Loss of Cultivated Lands	Construction	Medium to Low	Low	Low
Mitigation Measures				
• Avoidance of all high agricultural production land and other actively cultivated areas, where feasible. • Landowner engagement must be undertaken to investigate the possible scenarios for appropriate compensation of landowners for loss/disturbance of high land capability areas where possible.				
ID: Soil A2 Impact: Soil Compaction	Construction	Medium to Low	Low	Low
Mitigation Measures				
• Minimise project footprint as far as possible. Manage location of topsoil stripping stockpiling, demarcation of topsoil stockpiles and prevention of stockpile erosion and contamination. This can protect the topsoil stockpiles to keep it viable for rehabilitation purposes. • Restrict vehicle access to only those essential for seismic work; use vehicles with wide, low-pressure tires. • Prohibit vehicle movement during or immediately after heavy rainfall to avoid excessive compaction. • Cover exposed soil with mulch or brush immediately after disturbance to reduce erosion risk. • Speed restriction of no more than 20 km/h must be implemented for all construction vehicles within the construction site				
ID: Soil A3 Impact: Soil Erosion	Construction	Medium to Low	Low	Low
Mitigation Measures				
• Minimise removal of vegetation as far as possible. • Implement dust suppression measures in all areas that will be affected by construction activities and where dust will be generated. Dust suppression must also be undertaken during windy and dry weather conditions. • Implementation of embedded controls such as geotextiles, gabion baskets can effectively control soil erosion on-site where detected.				
ID: Soil A4 Impact: Soil Contamination	Construction	Medium to Low	Low	Low
Mitigation Measures				
• Any equipment may leak, and does not have to be transported regularly, must be placed on watertight drips trays to catch any potential spillages of pollutants. The drip trays must be of a size that the equipment can be placed inside it. • Drip trays must be cleaned regularly and shall not be allowed to overflow. All spilled hazardous substances must be collected and adequately disposed off at a suitably licensed facility. • All hazardous substances (e.g. fuel, grease, oil, brake fluid, hydraulic fluid) must be handled, stored and disposed of in a safe and responsible manner so as to prevent pollution of the environment or harm to the people or animals. Appropriate measures must be implemented to prevent spillage, and appropriate steps must be taken to prevent pollution in the events of a spill. • Hazardous substances must be confined to specific and secured areas, and in such a way that does not pose any dander of pollution even during times of high rainfall.				

5.3 Operational Phase (Post Construction)

5.3.1 Post Construction: Rehabilitation

This phase will involve activities undertaken after the main exploration work is completed, aiming to restore the site to a suitable condition for the final land use activity and as a minimum, to its pre-construction state. This phase includes the de-establishment from the site.

Ancillary Activities:

- Revegetation
- Soil / slope stabilization
- Backfilling (if necessary)
- Erosion control

5.3.2 Post Construction : Gas Analysis and Maintenance

This phase involves measuring and analyzing the gas quantity and quality from the established blower.

Ancillary Activities:

- Continuous analysis of gas quantity and quality
- Initiate maintenance and aftercare program
- Environmental aspect monitoring

During post-construction phase, limited impacts are expected. Most activities associated with the construction phase will have Low impacts post-mitigation is foreseen. Only the footprint area will be disturbed to minimise soil and vegetation disturbance of the surrounding area. Ongoing site access for monitoring and maintenance may cause localized soil compaction and soil contamination due to spills of hydrocarbons due to traffic. Soil erosion control methods where potential erosion effects are detected like geotextile sheets, gravel mulch will be carried out on exposed surrounding areas to avoid surface erosion. Maintenance of these soil covers, and associated infrastructure structure will have to be carried out throughout the life of the gas drilling.

Table 5-2 Impact assessment related to the loss of land capability during the post-construction phase of the Motuoane Exploration Right 386 project

ID: Soil A5	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
Impact: Soil Compaction	Operational	Medium to Low	Low -	Low -
Mitigation Measures				
• Compacting of soil must be avoided as far as possible, and the use of heavy machinery must be restricted in areas outside of the proposed exploration sites to reduce the compaction of soil. • Where possible, drilling sites should be located along existing access roads, to reduce the requirement for additional roads. • Prohibit vehicle movement during or immediately after heavy rainfall to avoid excessive compaction. • Cover exposed soil with mulch or brush immediately after disturbance to reduce erosion risk. • Speed restriction of no more than 20 km/h must be implemented for all heavy vehicles.				
ID: Soil A6 Impact: Soil Erosion	Operational	Medium to Low	Low	Low

Mitigation Measures				
• Minimise project footprint as far as possible. Manage location of topsoil stripping stockpiling, demarcation of topsoil stockpiles and prevention of stockpile erosion and contamination. This can protect the topsoil stockpiles to keep it viable for rehabilitation purposes. • Restrict vehicle access to only those essential for seismic work; use vehicles with wide, low-pressure tires. • Prohibit vehicle movement during or immediately after heavy rainfall to avoid excessive compaction. • Cover exposed soil with mulch or brush immediately after disturbance to reduce erosion risk. • Speed restriction of no more than 20 km/h must be implemented for all construction vehicles within the construction site.				
ID: Soil A7 **Impact: Soil Contamination**	**Operational**	**Medium to Low**	**Low**	**Low**
Mitigation Measures				
• Any equipment may leak, and does not have to be transported regularly, must be placed on watertight drips trays to catch any potential spillages of pollutants. The drip trays must be of a size that the equipment can be placed inside it. • Drip trays must be cleaned regularly and shall not be allowed to overflow. All spilled hazardous substances must be collected and adequately disposed off at a suitably licensed facility. • All hazardous substances (e.g. fuel, grease, oil, brake fluid, hydraulic fluid) must be handled, stored and disposed of in a safe and responsible manner so as to prevent pollution of the environment or harm to the people or animals. Appropriate measures must be implemented to prevent spillage, and appropriate steps must be taken to prevent pollution in the events of a spill. • Hazardous substances must be confined to specific and secured areas, and in such a way that does not pose any dander of pollution even during times of high rainfall.				

5.4 Final Rehabilitation, Decommissioning and Closure Phases

This phase involves the final plugging and closure of the blower.

Ancillary Activities:

- Plugging of boreholes
- Revegetation
- Soil / slope stabilization

5.5 Monitoring, Maintenance and Relinquishment Phases

This phase involves the monitoring and analysis of the effectiveness of final closure and rehabilitation undertaken.

Ancillary Activities:

- Groundwater monitoring
- Floral monitoring
- Gas emission monitoring

During the decommissioning, monitoring, maintenance and relinquishment phases, most activities will take place on site and limited impacts are foreseen. The plugging of boreholes will help to prevent the migration of contaminants to the soil and groundwater. The revegetation will stabilize the soil, reduce erosion. Soil and slope stabilization will further prevent soil erosion and sedimentation in the nearby water bodies. These activities are aimed at restoring the land capability of the soil and the subsequent agricultural productivity of the area.

Table 5-3 Impact assessment related to the loss of land capability during the Final rehabilitation, Decommissioning and Closure phases of the Motuoane Exploration Right 386 project

ID: Soil A8	Phase	Pre-Mitigation Significance	Post-Mitigation Significance	Final Significance
Impact: Soil Compaction	Decommissioning and Closure	Low	Low -	Low -
Mitigation Measures				
• Compacting of soil must be avoided as far as possible, and the use of heavy machinery must be restricted in areas outside of the proposed exploration sites to reduce the compaction of soil. • Prohibit vehicle movement during or immediately after heavy rainfall to avoid excessive compaction. • Rehabilitation of the disturbed areas must be made a priority. Any disturbed area must be re-habilitated to its pre-disturbed state as defined in the pre-drilling survey. Disturbed areas must be rehabilitated to support its post-closure land use, and ot misy be undertaken within six (6) months post drilling activities.				
ID: Soil A6 Impact: Soil Erosion	Decommissioning and Closure	Low	Low -	Low -
Mitigation Measures				
• The stockpiled topsoil will be returned to the surface of the reinstated areas. For topsoil's with high enrichment seedbanks, additional seeding may not be required, but this would need to be monitored over time. If necessary, seed form the surrounding areas should be used to augment the topsoil seedbank.				
ID: Soil A7 Impact: Soil Contamination	Decommissioning and Closure	Low	Low -	Low -
Mitigation Measures				
• All drilling sites must be properly sealed to trap gases from escaping. Wells should be plugged to prevent crossflow of gas into aquifers and isolate all potential hydrocarbon / water bearing formations by utilizing placed cement plugs extending at least 30m above and below the reservoir. • All grouting or cement should be "ready-mixed" if possible. Alternatively, any mixing must be completed on a temporary impermeable layer or in a container. • All pouring of cement or grouting should be completed over a temporary impermeable layer to avoid spillage. • Cleaning of the chute of the cement truck, if applicable, should be done over a temporary impermeable layer. • Any general waste, excess or waste material or chemicals, including drilling muds etc. must be removed from the site and must preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled must be disposed of at a suitably licensed waste facility.				

5.6 Specialist Management Plan

The approved management measures for the Motuoane ER315 project, as outlined in the Amended Environmental Management Programme (EMPr), drafted by EIMS (2024), they remain relevant and sufficient. No additional mitigation measures are required for the Motuoane Exploration Right 386 Application.

5.7 Cumulative Impacts

The quantitative impact of the proposed project in isolation on agriculture is anticipated to be "Low" due to the avoidance of highly sensitive field crops. The cumulative impact of the proposed project is anticipated to be "Medium" (see Table 5-1 to Table 5-3). The project area has undergone historic and current modification, like the developmental disturbances associated to the mining activities that the local area has currently.

After implementation of the mitigation measures such as implementation of erosion control methods, preventing soil contamination and rehabilitating disturbed and bare surfaces as stipulated above the agricultural productivity of the area is not expected to deteriorate further because of the proposed development and no irreplaceable loss of resources is anticipated.

6 Conclusion

The proposed target drilling areas are dominated by medium potential soils such as Ermelo, Griffin, Clovelly, Pinedene, Westleigh, Katspruit, Kroonstad and Rensburg soil forms. The remaining extent of the proposed target areas is associated with low potential soils namely the Sepane, Arcadia, Johannesburg, Stilfontein and Grabouw soil forms. Active crop fields were confirmed within the target areas.

The land capability sensitivity (DAFF, 2017) indicates the proposed project area falls within "Low-Moderate" and "Moderate to Moderate-High" land capability sensitivities and with marginal areas having "Very Low to Low" land capability sensitivity. Furthermore, highly and very highly sensitive field crop boundaries were also identified using the DFFE Screening Tool Report. The verified baseline findings, current land uses and the calculated land potential concur to an extent with areas associated with "Low-Moderate" and "Very Low to Low" land capability sensitivities and highly sensitive field crop boundaries. They further dispute to an extent with all areas demarcated with very highly sensitive field crop boundaries and "Moderate to Moderate-High" land capability sensitivity within the proposed target areas. Commercial maize and soyabean production under rainfed conditions were confirmed within the target drilling areas alongside historical crop fields. It is worth noting that the proposed drilling within the target areas will have a minor footprint (50 × 50 m) and. Therefore, is expected to have a negligible impact of soil and agricultural resources of the area.

The desktop assessment database (Land Type Survey Staff, 1972 – 2006) for the areas forming the entire seismic right area excluding the site verified proposed seismic survey drilling areas indicates that the areas are characterised with the Dundee, Avalon, Bainsvlei, Hutton, Clovelly, Oakleaf, Rensburg, Willowbrook, Valsrivier, Swartland, Sterkspruit, Glenrosa and Mispah soil forms. Moreover, active cropping under rainfed and irrigation infrastructure were comfited within the assessed area. These areas have sensitivity ranging from "Very Low to High to Very High", which can be verified through specialist field assessments.

6.1 Impact Statement

Active crop fields (Maize and Soyabeans) were identified within the proposed target drilling areas. The proposed project will result in marginal land segregation and fragmentation of high production crop fields with the current proposed infrastructure layout. It is the opinion of the specialist that the proposed Motuoane Exploration Right 386 Application project and associated infrastructure project can be considered for authorisation with recommended mitigations to be adhered to, by the Competent Authority.

6.2 Statement Conditions

The conclusion of this assessment, regarding the acceptability of the project and the recommendation of its approval, is subject to adoption and implementation of the mitigation measures approved for the Motuoane ER315 project, as outlined in the Amended Environmental Management Programme (EMPr) prepared by EIMS (2024), without any additional measures.

7 References

Brady, N.C. and Weil, R.R. 2008. The nature and properties of soils. Pearson Education Inc., Upper Sadle River, New Jersey. 14th Edition.

Department of Environmental Affairs (DEA). (2010) Framework for the Management of Contaminated Land

Department of Primary Industries and Regional Development. 2019. Measuring soil salinity. https://www.agric.wa.gov.au/soil-salinity/measuring-soil-salinity.

Environmental Impact Management Services (EIMS). 2024. AMENDED ENVIORNMENTAL MANAGEMENT PROGRAMME (EMPR). Part II Amendment of the Approved Environmental Management Programme for The Proposed Exploration of Hydrocarbons and Associated Gas on Various Farms Near the Town of Hennenman, within the Fezile Dabi District and Lejweleputswa District Municipalities, Free State Province. EA Reference number: 12/3/315. Johannesburg, South Africa.

Fertilizer Society of South Africa. (2016). Fertilizer Handboo/k. Lynnwood ridge, South Africa: Fertilizer Society of South Africa.

Land Type Survey Staff. 1972 - 2006. Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Mucina, L., & Rutherford, M. C. 2006. The Vegetation of South Africa, Lesotho, and Swaziland. Strelitzia 19. Pretoria: National Biodiversity Institute.

Schulte, E.E. 2004. Soil and Applied Chlorine. Understanding plant nutrients. http://corn. agronomy.wisc.edu/Management/pdfs/a3556.pdf

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

Soil Classification Working Group. 1991. Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

Soil Classification Working Group. 2018. Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development/

8 Appendix Items

8.1 Appendix A: Methodology

8.1.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of QGIS and SAGA software.

8.1.2 Field Survey

The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1.2 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the “Soil Classification: A Taxonomic System for South Africa” (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

8.1.3 Erosion Potential

Erosion has been calculated by means of the Soil Loss Estimation for Southern Africa (SLEMSA) methodology described in Smith (2006). The steps in calculating the Fb ratings relevant to erosion potential is illustrated in Table 8-1, with the final erosion classes illustrated in Table 8-2.

Table 8-1 Fb ratings relevant to the calculating of erosion potential (Smith, 2006)

Step 1- Initial value, texture of topsoil horizon				
Light (0-15% clay)		Medium (15-35% clay)		Heavy (>35% clay)
Fine sand	Medium/coarse sand	Fine Sand	Medium/coarse sand	All sands
3.5	4.0	4.5	5.0	6.0
Step 2- Adjustment value (permeability of subsoil)				
Slightly restricted	Moderately restricted	Heavily restricted		
-0.5	-1.0	-2.0		
Step 3- Degree of leaching (excluding bottomlands)				
Dystrophic soils, medium and heavy textures	Mesotrophic soils	Eutrophic or calcareous soils, medium and heavy textures		
+0.5	0	-0.5		
Step 4- Organic Matter				
Organic topsoil	Humic Topsoil			
+0.5	+0.5			
Step 5- Topsoil limitations				
Surface crusting	Excessive sand/high swell-shrink/self-mulching			
-0.5	-0.5			
Step 6- Effective soil depth				
Very shallow (<250 mm)	Shallow (250-500 mm)			

-1.0	-0.5

Table 8-2 Final erosion potential class

Erodibility	Fb Rating (from calculation)
Very Low	>6.0
Low	5.0 - 5.5
Moderate	3.5 – 4.5
High	2.5 – 3.0
Very High	<3.0

8.1.4 Land Capability

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

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

Table 8-3 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		MG - Moderate Grazing			MC - Moderate Cultivation					
F- Forestry		IG - Intensive Grazing			IC - Intensive Cultivation					
LG - Light Grazing		LC - Light Cultivation			VIC - Very Intensive Cultivation					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in the table below.

The land capability was determined by using the guidelines described in “The farming handbook” (Smith, 2006) which the DAFF land capabilities were further developed from. Accordingly, the identified soil forms associated with the PAOI are restricted to land capability I and II categorised between LC 9-10, land capability III and IV (under marginal soyabean rye grass cultivation, respectively), and V categorised between LC 6-8 and land capability IV and VI (under open veld) categorised between LC 1-5. The baseline soil land capability was compared to the National Land Capability data (DAFF, 2017), respectively.

Table 8-4 The combination table for land potential classification

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

Table 8-5 The Land Potential Classes

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

The land capability of the proposed footprint will be compared to the National Land Capability which was refined in 2014- 2016. The National Land Capability methodology is based on a spatial evaluation modelling approach and a raster spatial data layer consisting of fifteen (15) land capability evaluation values (Table 8-6), usable on a scale of 1:50 000 – 1:100 000 (DAFF, 2017). The previous system is based on a classification approach, with 8 classes (Table 8-3). Land capability and land potential will also be determined in consideration of the screening tool to ultimately establish the accuracy of the land capability sensitivity from (DAFF, 2017).

Table 8-6 National Land Capability Values (DAFF,2017)

Land Capability Evaluation Value	Land Capability Description
1	Very low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High

12	High to Very High
13	
14	Very High
15	

8.2 Appendix B Impact Assessment

Table 8-7 Impact assessment related to the loss of the land capability during the construction, operation, decommissioning and rehabilitation phases for the Moutuane Exploration Right 386.

Impact	Phase	Pre-Nature	Pre-Extent	Pre-Duration	Pre-Magnitude	Pre-Reversibility	Consequence	Pre-Probability	Pre-Mitigation Significance Score	Pre-Mitigation Significance	Post-Nature	Post-Extent	Post-Duration	Post-Magnitude	Post-Reversibility	Consequence2	Post-Probability	Post-mitigation Significance Score	Post-Mitigation Significance	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score	Final Significance
Loss of land capability, soil compaction, loss of cultivated lands, soil erosion.	Construction	-1	3	3	3	3	-3	2	-6	Medium to low -	-1	2	2	2	3	-2.25	1	-2.25	Low -	Medium	2	3	1.38	-3.09	Low -
Soil compaction, Soil erosion, Land degradation and Soil contamination	Operation	-1	2	3	2	2	-2,25	2	-4.5	Medium to low -	-1	2	2	2	1	-1,75	1	-1.75	Low -	Low	2	3	1.38	-2.41	Low -
Soil compaction, Soil erosion, Land degradation and Soil contamination	Decommissioning	-1	1	2	2	2	-1,75	2	-3,5	Low -	-1	1	1	1	2	-1,5	2	-1.25	Low -	Low	2	2	1.25	-1.13	Low -
Soil compaction, Soil erosion, Land degradation and Soil contamination	Rehab and Closure	-1	1	2	2	2	-1.75	2	-3.5	Low -	-1	1	2	1	2	-1,5	1	-1,5	Low -	Low	1	2	1.13	-1.69	Low -

8.3 Appendix C: Specialist declarations

DECLARATION

I, Masilabela Seepamore, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 24F of the Act.

Masilabela Seepamore

Soil & Agricultural Scientist

The Biodiversity Company

April 2026

DECLARATION

I, Matthew Mamera, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 24F of the Act.

Matthew Mamera

Soil Scientist

The Biodiversity Company

April 2026

8.4 Appendix D Curriculum vitae

Masilabela Seepamore

Pr Sci Nat 113907 +27 78 815 1878 masilabela@thebiodiversitycompany.com

PROFILE SUMMARY

Soil and Agricultural specialist with ~ 3 years' consulting experience. Specialist experience in project exploration, mining, engineering, hydropower, renewable energy, and private sector developments. Project management of national I multi-disciplinary projects. Provides specialist guidance, technical support, and facilitation for compliance with in-country legislative requirements and international lender standards. Registered Pr Sci Nat with the South African Council for Natural Scientific Professions.

PERSONAL INFO

Nationality: South African

Date of birth: 08 June 1988

EXPERIENCE

Environmental Impact Assessment (EIA)

Environmental Management Programmes (EMP)

Rehabilitation Plans

Agricultural potential assessments

Soil taxonomy classification (SA form)

SKILLS

- ✓ Soil Classification
- ✓ Project Management
- ✓ Soil & Crop Management
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient

Afrikaans & IsiZulu – Conversational

Tswana, Sesotho, Sepedi - Proficient

Signed: Masilabela Seepamore

ACADEMIC QUALIFICATIONS

FERTALIZER ASSOCIATION OF SOUTHERN AFRICA (FERTASA) (2021) – Fertilizer Advisory Certificate & Training Scheme (FACTS)

University of the Free State (2019): MAGISTER SCIENTIAE (MSc) *Cum Laude* – Soil Science:
Title: *Impact of long-term production management practices on wheat grain yield under a semi-arid climate.*

University of the Free State (2015): BACCALAUREUS SCIENTIAE AGRICULTURAE Honores (Hons) – Soil Science.

University of the Free State (2013): BACCALAUREUS SCIENTIAE AGRICULTURAE. Majors: Agronomy & Soil Science.

PROFESSIONAL EXPERIENCE

Sep 2023 – Present	**The Biodiversity Company** Soil Ecologist
Nov 2022 – Aug 2023	**ARC-NRE** Intern
Mar 2021 – Sep 2021	**Central University of Technology** Lecturer (Part-Time)
July 2016 – Dec 2018	**University of the Free State** Research Assistant

INTERNATIONAL EXPERIENCE

South Africa

Matthew Mamera

Pr Sci Nat 116356 +27 785 772 668 matthew@thebiodiversitycompany.com

PROFILE SUMMARY

Environmental and ecological specialist with 10 years' consulting experience, with international working experience. Specialist experience in project exploration, mining, engineering, hydropower, renewable energy, and private sector developments. Project management of national and international multi-disciplinary projects. Provides specialist guidance, technical support, and facilitation for compliance with in-country legislative requirements and international lender standards. Registered Pr Sci Nat with the South African Council for Natural Scientific Professions and the Soil Science Society of South Africa.

PERSONAL INFO

Nationality: South African Permanent Residence

Date of birth: 31 October 1988

EXPERIENCE

- Environmental Impact Assessments (EIA)
- Soil taxonomic classification (SA forms and WRB groups)
- Soil Hydropedology, Agricultural and Land contamination assessments
- Soil Carbon credits

SKILLS

- ✓ Soil and Soil Hydropedology Assessments
- ✓ Agricultural, soil and water contamination Assessments
- ✓ Rehabilitation
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient

Zulu, Xhosa, Ndebele, Sotho – Conversational

Afrikaner - Basic

Signed: Dr Matthew Mamera

ACADEMIC QUALIFICATIONS

University of the Free State (2021): Doctor of Philosophy (PhD) - Soil Science:
Title: *Assessing pollution and managing faecal sludge through biochar applications in Phuthaditjhaba, South Africa.*

University of the Fort Hare (2018): Master of Science (MSc) - Soil Science:
Title: *Pollution potential of on-site dry sanitation systems associated with the Mzimvubu Water Project, Eastern Cape, South Africa.*

University of the Fort Hare (2015): Bachelor of Science Honours *Cum laude* (Hons) – Soil Science

University of the Fort Hare (2001 - 2004): Bachelor of Science Agriculture in Soil Science. Majors: Soil Science.

PROFESSIONAL EXPERIENCE

Mar 2022 – Present	**The Biodiversity Company** Soils Unit Manager / Soil & Soil Hydropedology
Feb 2018 – Dec 2020	**University of the Free State** Junior Researcher, lecturer / Soil Science
Jan 2015 – Dec 2017	**University of Fort Hare** Junior Research, Tutor / Soil Science

INTERNATIONAL EXPERIENCE

Angola, Botswana, Namibia, Zambia, South Africa