SOIL AND AGRICULTURAL POTENTIAL ASSESSMENT REPORT FOR THE PROPOSED GHANJA MINING PERMIT

Ingquza Hill Local Municipality, OR Tambo District Municipality, Eastern Cape Province, South Africa

5/15/2024

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 POTENTIAL ASSESSMENT REPORT FOR THE PROPOSED GHANJA MINING PERMIT**
Specialist Theme	Agricultural Theme
Project Reference	Ghanja Mining Permit
Report Version	5/15/2024
Environmental Assessment Practitioner	
Fieldwork & Report Writer	Masilabela Seepamore (SACNASP 11307)
Reviewer	Andrew Husted (SACNASP 400213/11)
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, 2017. 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 by Henred Trading (Pty) Ltd to conduct a soil and agricultural potential assessment for the proposed Ghanja Mining Permit Project. The proposed applicant development of apply for a mining permit to mine stone aggregate and gravel on the portion of Remaining Extent of the Farm 89, located within the Ngquza Hill Local Municipality in the Eastern Cape Province, South Africa.

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, 2024) has characterised the agricultural theme sensitivity of the project area as predominantly “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 50 m buffered area. 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 mining permit project.

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

The applicant is proposing mining of stone aggregate and gravel on a portion of Remaining Extent of Farm 89, within the Ngquza Hill Local Municipality in the Eastern Cape Province. The total development footprint is approximately 5 ha and will be developed over an undisturbed area of the farm. The mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. All mining related activities will be contained within the approved mining permit boundaries. The aggregate will be stockpiled until it is transported from site using tipper trucks. All mining related activities will be contained within the approved mining permit boundaries.

The proposed project triggers listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations 2014 (as amended 2017) and therefore requires an environmental impact assessment (basic assessment process) that assess project specific environmental impacts and alternatives, consider public input, and propose mitigation measures, to ultimately culminate in an environmental management programme that informs the competent authority (Department of Mineral Resources and Energy) when considering the environmental authorisation. This report, the Draft Basic Assessment Report, forms part of the departmental requirements, and presents the first report of the EIA process.

1.2.1 Project Area

The applicant is proposing mining of stone aggregate and gravel on a portion of Remaining Extent of Farm 89, within the Ngquza Hill Local Municipality in the Eastern Cape Province. The proposed side

were identified and surveyed mainly the Stockpile Area, the Chip Plant Area, the Quarry, and the path to works area. The activity around the proposed sides includes communal crop and livestock production.

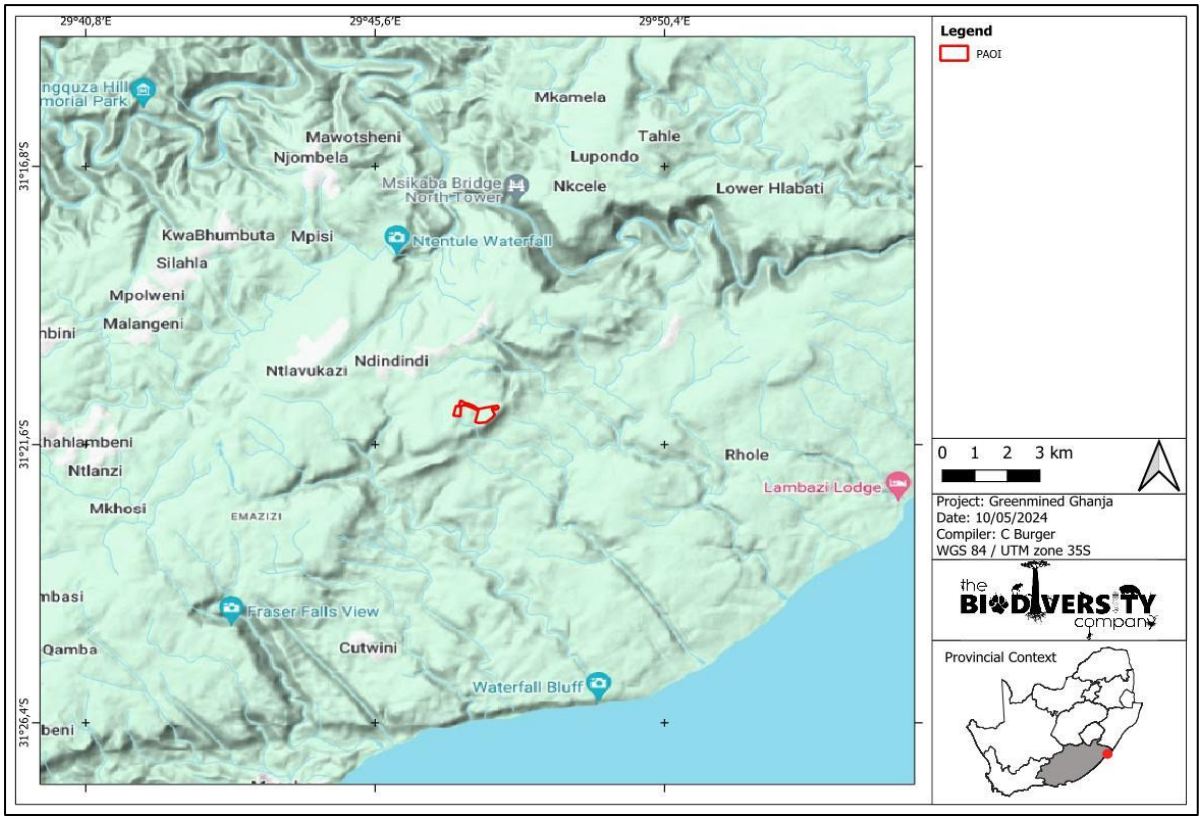


Figure 1-1 Spatial context of the proposed development

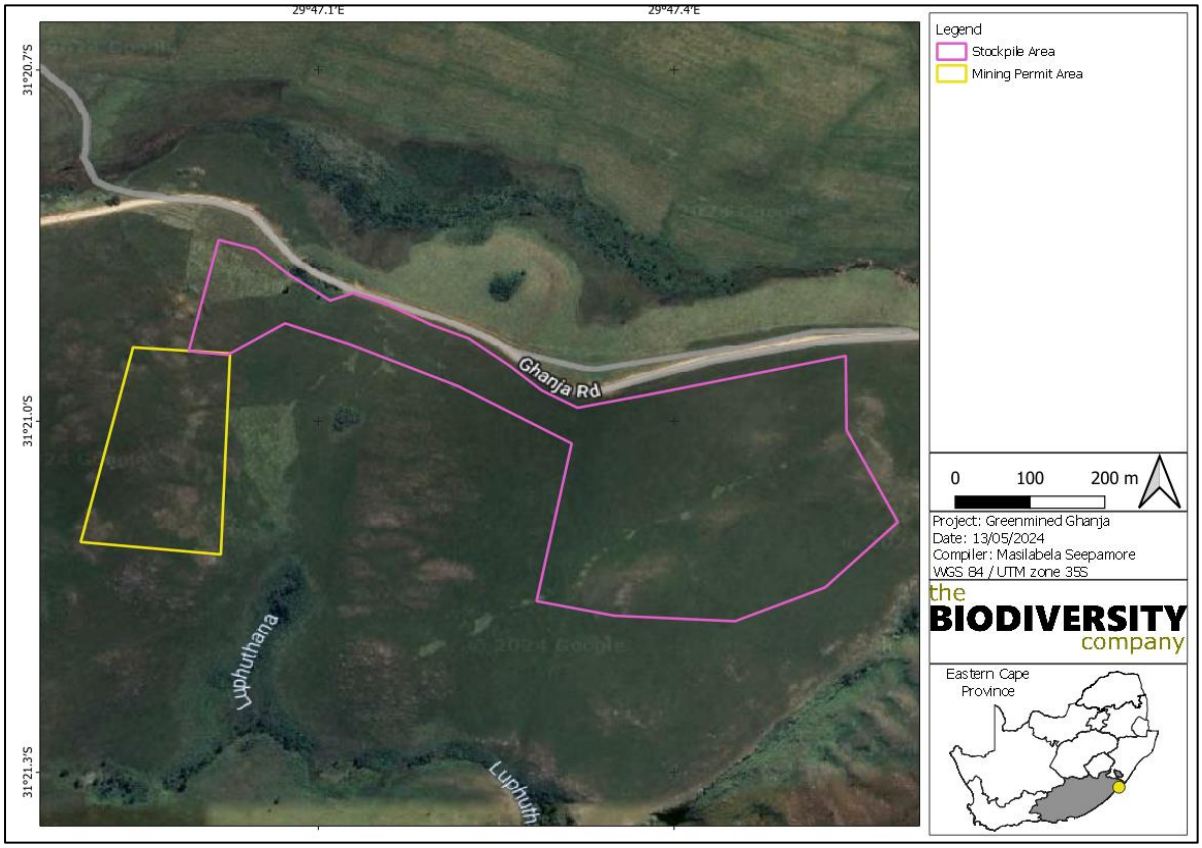


Figure 1-2 Map illustrating the layout of the proposed development

1.3 Scope of Work

In addition to the requirements stipulated in GNR 320, the following Terms of Reference, as stipulated, apply to the Agricultural Compliance Statement:

- Ensure a thorough assessment, that includes both the desktop assessment of databases and aerial photography; a description of the on-site verification of the agricultural potential of the area; and the soil forms present in the development area;
- Identify and assess potential impacts on both agricultural potential and soil resulting from the proposed project;
- Identify and describe potential cumulative soil, agricultural potential and land capability impacts resulting from the proposed project in relation to proposed and existing developments in the surrounding area; and
- Recommend mitigation, management and monitoring measures, to minimise impacts and/or optimise benefits associated with the proposed project.

1.4 Assumptions and Limitations

The following aspects were considered as limitations;

- Soil fertility analysis was not conducted on-site for this report;
- Due to the overall low to medium land capability sensitivity for the area, a compliance statement has been submitted;
- 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; and
- No heavy metals have been assessed nor fertility been analysed for the relevant classified soils.

1.5 Key Legislative Requirements

The report follows the protocols as stipulated for agricultural assessment in Government Notice 320 of 2020 (GNR 320). This Notice provides the procedures and minimum criteria for reporting in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (No. 107 of 1998) (NEMA).

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

- Conservation of Agricultural Resources Act (Act 43 of 1983);
- Environment Conservation Act (Act 73 of 1989);
- National Environmental Management Act (Act 107 of 1998); and
- National Water Act (Act 36 of 1998).

1.6 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:
    - "medium sensitivity" for agriculture, must submit an Agricultural Compliance Statement.

An Agricultural Compliance Statement must contain the information as presented below.

Table 1-1 Agricultural Compliance Statement 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	Pg i / Appendix C
a signed statement of independence by the specialist	Appendix B
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	Section 2.1
confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities	None
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	Section 5.2
any conditions to which this statement is subjected	Section 5.3
in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase	N/A
where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr	Section 5.1 / 4.5.4
a description of the assumptions made as well as any uncertainties or gaps in knowledge or data	Section 1.4

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

2 Fieldwork

2.1 Field Assessment

The field survey was completed from the 08th to the 09th of May 2024, to determine the soil forms and current land uses within the assessed area (Figure 2-1).

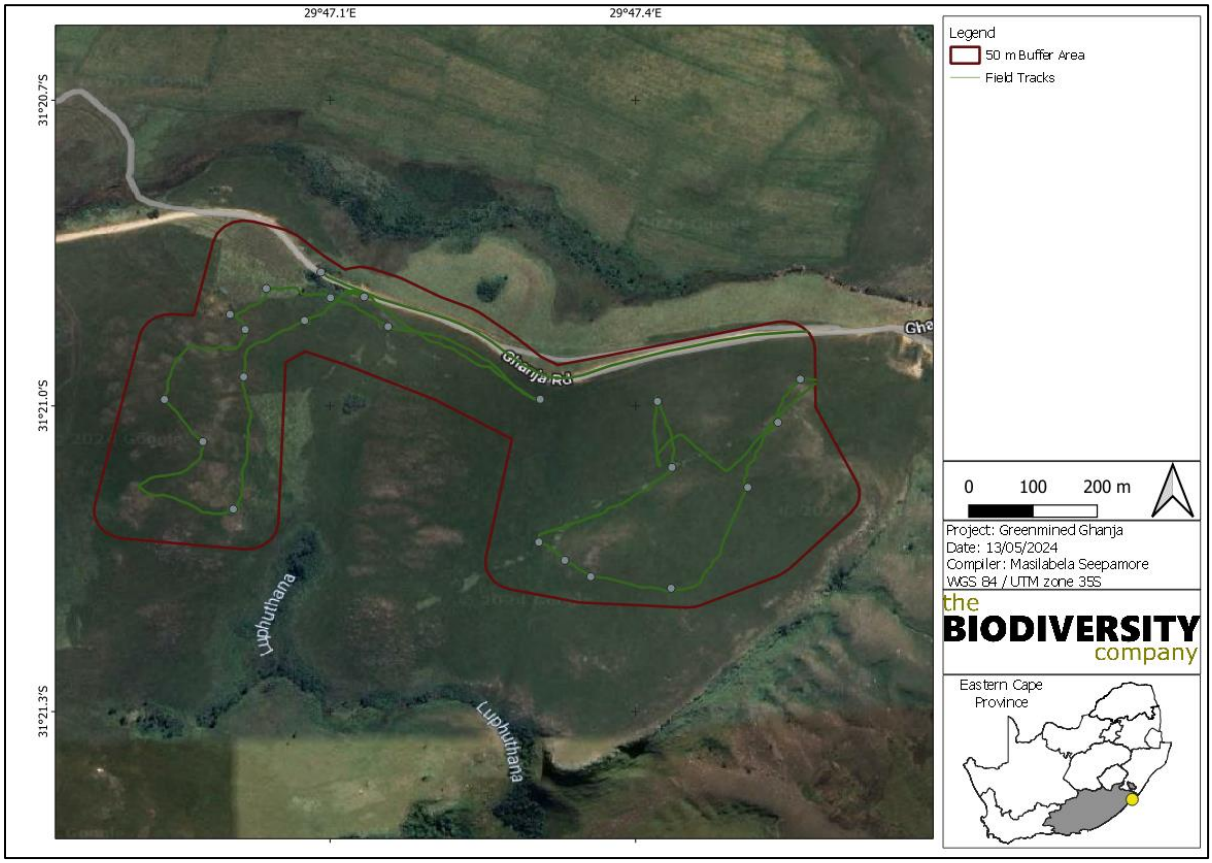


Figure 2-1 Map illustrating the field tracks of the field survey

3 Project Area

3.1 Desktop Information

3.1.1 Climate

The project area falls within the Pondoland-Ugu Sandstone Coastal Sourveld vegetation. It is characterised with strong summer rainfall with some rain in winter and no or very infrequent incidence of frost. The area has a MAP ranging is approximately 1075 mm (Mucina & Rutherford, 2006; Figure 3-1).

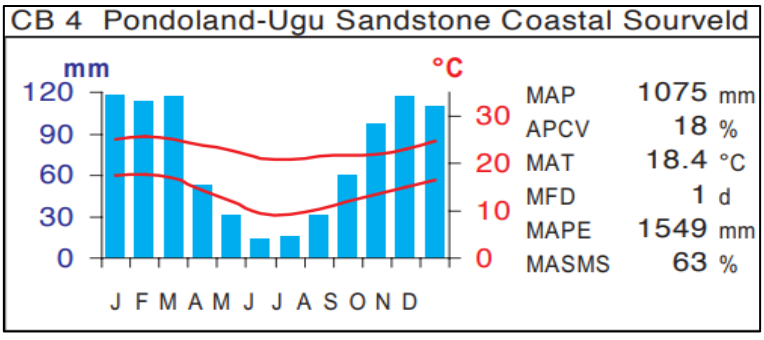


Figure 3-1 Summarised climate for the region (Mucina & Rutherford, 2006)

3.1.2 Geology & Soils

The geology of the area includes hard, white, coarse-grained, siliceous quartz arenites (sandstone) of the Msikabe Formation of the Devonian Period, giving rise to shallow, nutrient-poor (highly leached),

skeletal, acidic sandy soils. Almost 80% of the area is classified as Fa land type, followed by Aa land type.

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area falls within the Ad 47 land types (see Figure 3-2). The Ad 47 land type mainly consists of Clovelly and Oakleaf soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Ad land type is also characterised by red-yellow apedal, freely drained soils; yellow, dystrophic and/or mesotrophic. The land terrain units for the featured Ad 47 land type are illustrated in Figure 3-3 with the expected soils listed in Table 3-1.

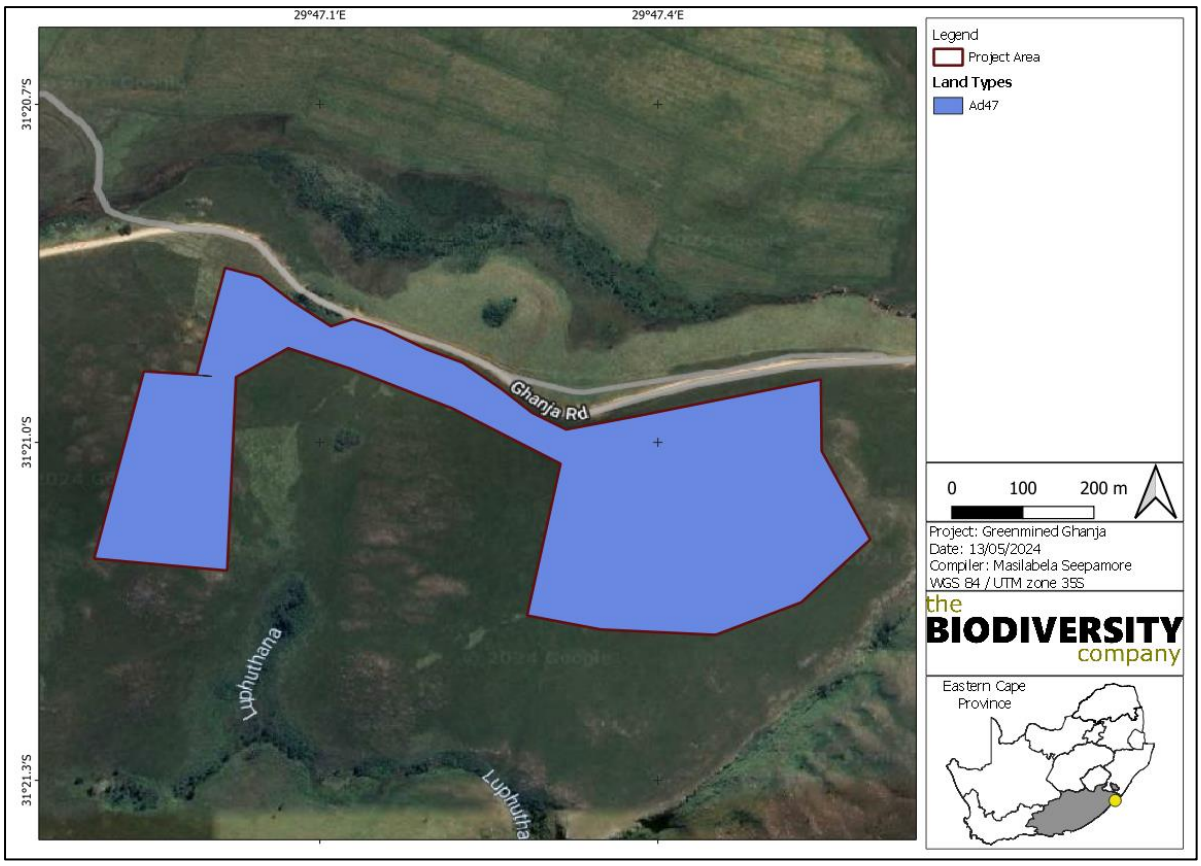


Figure 3-2 Land types associated with the proposed project area

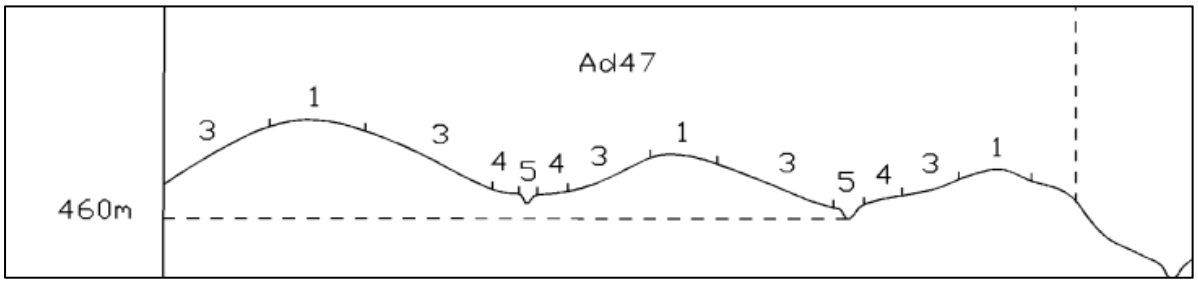


Figure 3-3 Illustration of land type Ad 47 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 3-1 Soils expected at the respective terrain units within Ad 47 land type (Land Type Survey Staff, 1972 – 2006)

Terrain units							
1 (25%)		**3 (70%)**		**4 (3%)**		**5 (2%)**	
Clovelly	35%	Clovelly	20%	Clovelly	70%	Oakleaf	55%

Mispah	20%	Mispah	20%	Cartref	10%	Stream Beds	40%
Magwa	20%	Magwa	20%	Oakleaf	10%	Bare Rocks	5%
Cartref	10%	Bare Rocks	20%	Mispah	5%		
Bare Rocks	10%	Cartref	10%	Bare Rocks	5%		
Glenrosa	5%	Glenrosa	5%				
		Inanda, Hutton	5%				

4 Results and Discussion

4.1 Description of Soil Profiles and Diagnostic Horizon

Soil profiles were studied up to 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;
- Yellow-brown apedal subsoil horizon;
- Soft Plinthite subsoil horizon;
- Neocutanic subsoil horizon;
- Albic subsoil horizon;
- Unconsolidated material with wetness subsoil horizon;
- Lithic subsoil horizon: and
- Hard Rock substratum 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 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.

4.1.3 Soft plinthic subsoil horizon

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 biopores. These are visible as high chroma mottles, together with redox depletions also of high value yet with a low chroma soil matrix or mottles. Distribution of the horizon correlates with that of the hydrology with its dominant occurrence in sandy soils and flat terrain, and with increasing expression at low slope angles in semi-arid to sub-humid climates (Soil Classification Working Group, 2018).

4.1.4 Neocutanic subsoil horizon

The horizon is weakly-structured subsoil horizon with variegated soil colours. It is commonly, though not exclusive, associated with material of colluvial or alluvial origin located in foot slopes and river terraces that have been subjected to an intermediate stage of pedogenic alteration. Colour variations in neocutanic horizons are usually the result the result of illuvial material that coats weak structural units.

4.1.5 Albic subsurface horizon

Albic horizons have generally uniform matrix colour derived from dominantly grey to whitish colouration of clay particles and from the colour of exposed quartz particles that commonly range from a whitish to pale yellow colouration. Many albic horizons have a sand to sandy loam texture, although sandy clay loam and finer textures are also encountered. The bleached properties of the albic horizon result variously from a change in oxidation state of iron minerals and from reduction, eluviation of clays, and in the podzolization process by loss of humus (Soil Classification Working Group, 2018).

4.1.6 Unconsolidated material with wetness subsoil horizon

The horizon comprises unconsolidated soil material showing limited evidence of pedogenesis and horizonation and having evidence of gleying (Soil Classification Working Group, 2018).

4.1.7 Lithic subsoil horizon

Lithic horizon consists of friable soil-like morphology that resulted from pedogenic alteration, ranging from strong weathering of the underlying country rock to partially weathering of the hard rock fragments. The subsoil may express a gleying characteristics in a form of iron mineral reduction, when subjected to saturation conditions.

4.1.8 Hard rock subtrutum horizon

The horizon comprises of hard country rock where primarily physical weathering has taken place, ranging from a fractured rock horizon variant with numerous closely aligned fractured planes, but lack soil development between fractures, to a solid rock horizon variant with limited and widely spaced fractures. The horizon has very limited capability for root development of most annual plants, though roots of selected trees and shrubs may penetrate the limited fracture occupying specialised 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					
		Avalon	**Tshiombo**	**Oakleaf**	**Fernwood**	**Glenrosa**	**Mispah**
Topsoil	Depth (mm)	0-300	0-300	0-300	0-300	0-400	0-150
	Clay (%)	0-15	0-15	0-15	0-15	0-15	0-15
	Signs of Wetness	None	None	None	Present	None	None

	Rock (%)	0	0	0	0	0	0
	Surface crusting	None	None	None	Present	Present	Present
Subsoil B1	Depth (mm)	300-450	300-800	300-1200	300-1200	400-500	+150
	Clay (%)	0-15	15-30	15-30	15-30	0-15	0-15
	Signs of Wetness	None	None	None	Present	None	None
	Rock (%)	0	0	-	-	+35	100
Subsoil B2	Depth (mm)	450 -1200	800-1200	-	-	-	-
	Clay (%)	>35	15-30	-	-	-	-
	Signs of Wetness	Present	Present	-	-	-	-
	Rock (%)	+5	-	-	-	-	-

Table 4-2 Description of soil family characteristics

Soil Form/Family	Topsoil Colour	Base Status	Textural Contrast
Avalon 2120 (15)	Chromic Topsoil	Mesotrophic	Luvic
Tshiombo 2220 (15)	Chromic Topsoil	Mesotrophic	Luvic
Oakleaf 2220 (15)	Grey Topsoil	Dystrophic	Luvic
Fernwood 1110 (15)	Grey Topsoil	Dystrophic	Luvic
Glenrosa 2120 (15)	Grey Topsoil	Dystrophic	Aluvic
Mispah 2220 (15)	Grey Topsoil	Dystrophic	Aluvic

4.3 Discussion

The six representative soil forms that were identified within the 50 m buffer area include the Avalon, Tshiombo, Oakleaf, Fernwood, Glenrosa and Mispah forms, with Mispah being the dominant soil form (see Figure 4-1). The area also consists of numerous rocky areas, and wetlands exhibiting hydromorphic properties such bleached colours, and accumulation of finer materials. The different soil forms identified within the proposed project area, as well as the current land uses are illustrated in Figure 4-2 and Figure 4-3, respectively.

The most sensitive soil form identified within the proposed project area, with a high suitability for crop production is the Avalon soil form. The Avalon soil form consists of an orthic topsoil horizon on top of yellow brown horizon underlain with a soft plinthic horizon. This soil is characterised with a high suitability for crop production due to the good aeration, drainage and fertility. Furthermore, the presence of soft plinthic subsoil horizon promote water storage capacity, lessens evapotranspiration and moderate nutrient leaching.

The other less sensitive soil forms identified within the project area, with moderate suitability for crop production are Tshiombo, Oakleaf and Fernwood forms. The Tshiombo soil from consists of an orthic topsoil horizon on top of a neocutanic horizon underlain with unconsolidated material with wetness below. The Oakleaf soil from consists of an orthic topsoil horizon on top of a thick neocutanic horizon below. The Fernwood soil form consists of an orthic topsoil horizon on top of a thick albic horizon below. These soils are subjected to prolonged subsoil saturation which limits drainage and can subject crops to prolonged anaerobic condition due excessive subsoil saturation. Moreover, an increase in clay content in the subsoil horizon of an oakleaf soil form may limit root development.

The less sensitive soil forms identified within the project area, with less suitability for crop production includes, the Glenrosa and Mispah forms. The Glenrosa soil form consists of an orthic topsoil horizon on top of a lithic horizon below. These soils are considered to have a lower suitability for crop production

and growth due to their restrictive limitations which include impermeable subsoil horizons of a lithic and hard rock, and inundated condition resulting from over saturation.

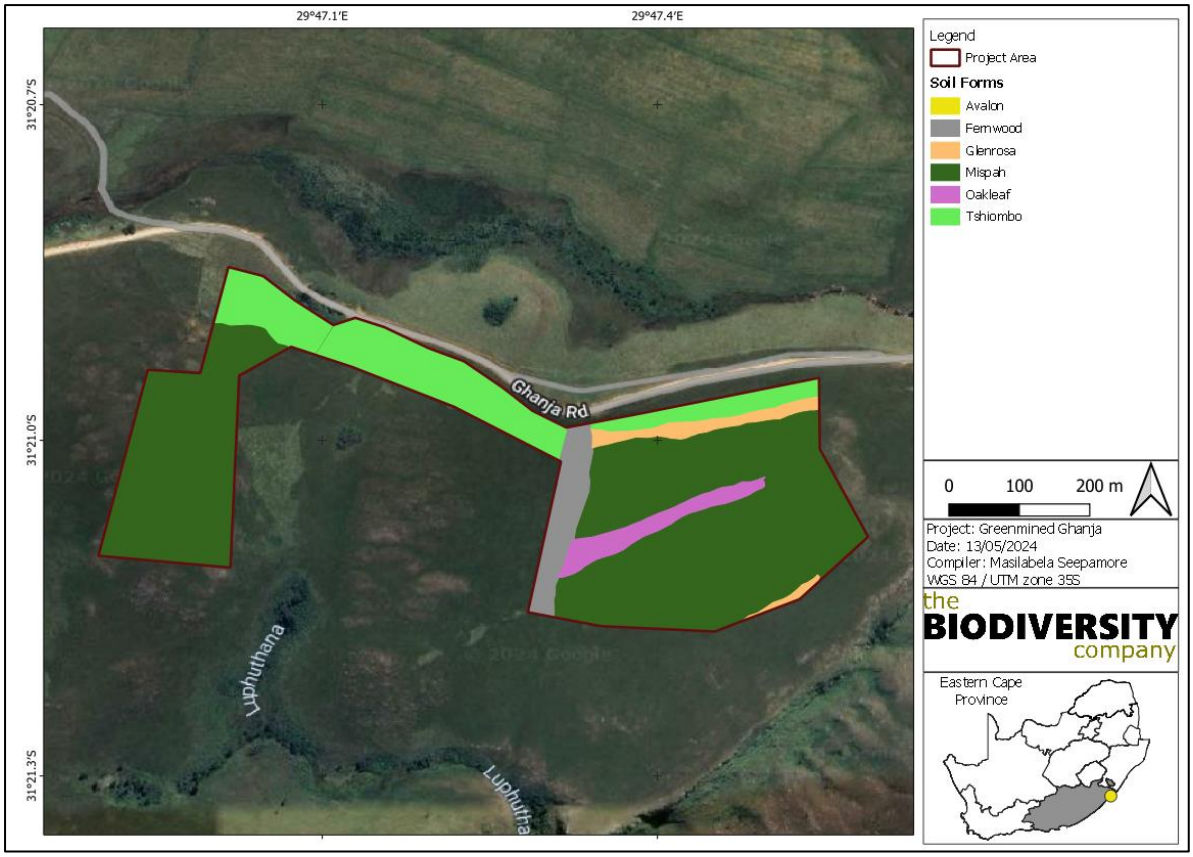


Figure 4-1 Soil forms found within the proposed project area

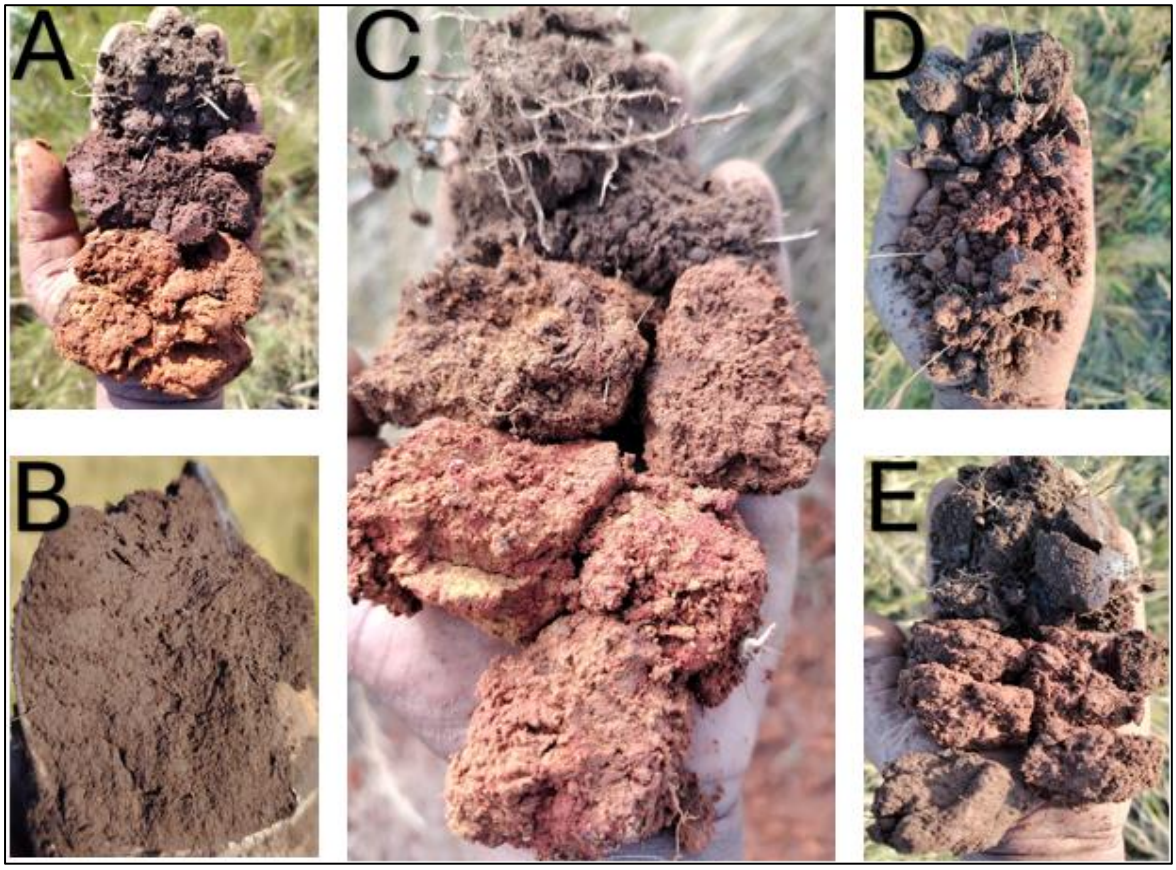


Figure 4-2 ***Diagnostic soil forms identified on-site: A) Tshiombo soil from; B) Albic subsoil horizon found in Fernwood soil form; C) Avalon soil from; D) Glenrosa soil form; and E) Oakleaf soil from***

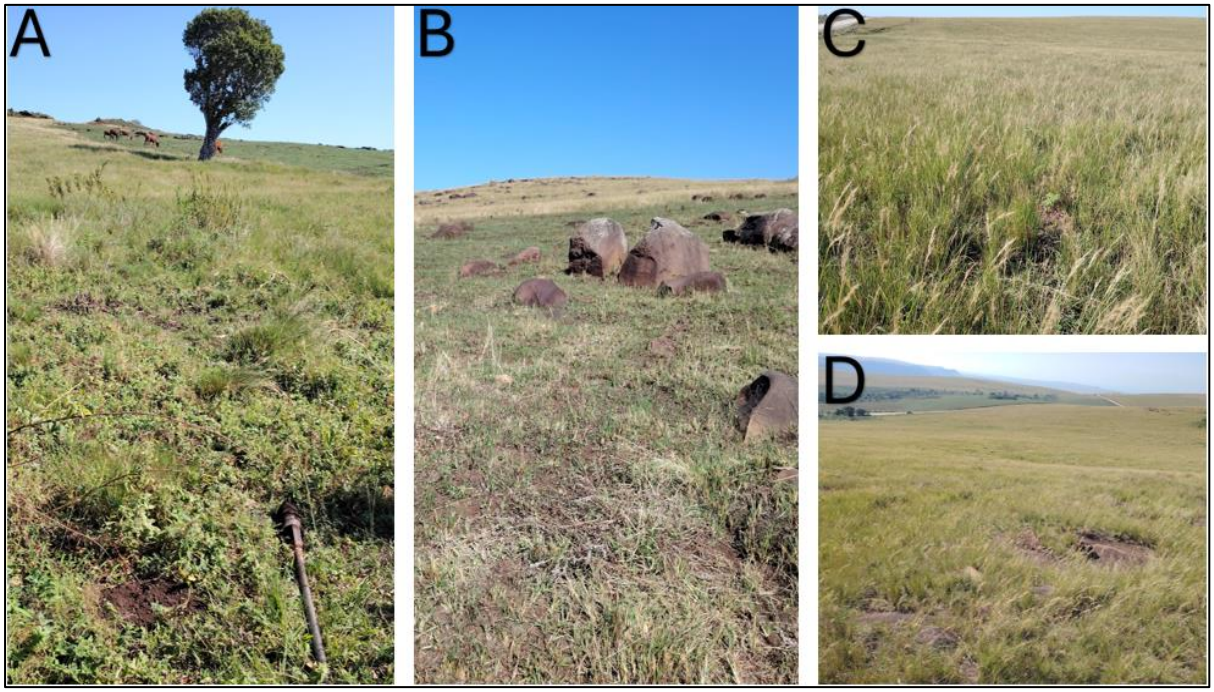


Figure 4-3 ***Different land uses identified within the 50 m buffer area; A) grazing livestock; B) rocky areas; C) common vegetation; and D) general topography of the project area.***

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 4-3).

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 has been determined to be “C2” for the project area. Moreover, the mean September temperature is less than 10°C, thus making the ultimate climatic capability to be “C6” 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 five different slope classes (0-5%, 5-10%,10-15%, 15-20 and 20-21%,) 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 3, 5 and 6 classes.

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
3	Moderate limitations. Some erosion hazard.	Special conservation practice and tillage methods.	Rotation of crops and ley (50%)	Arable	Medium
5	Water course and land with wetness limitations.	Protection and control of water table	Improved pastures, suitable for wildlife	Non-Arable	Medium
6	Limitation preclude cultivation. Suitable for perennial vegetation.	Protection measures for establishment, e.g., sod-seeding	Veld, pasture, and afforestation	Non-arable	Low

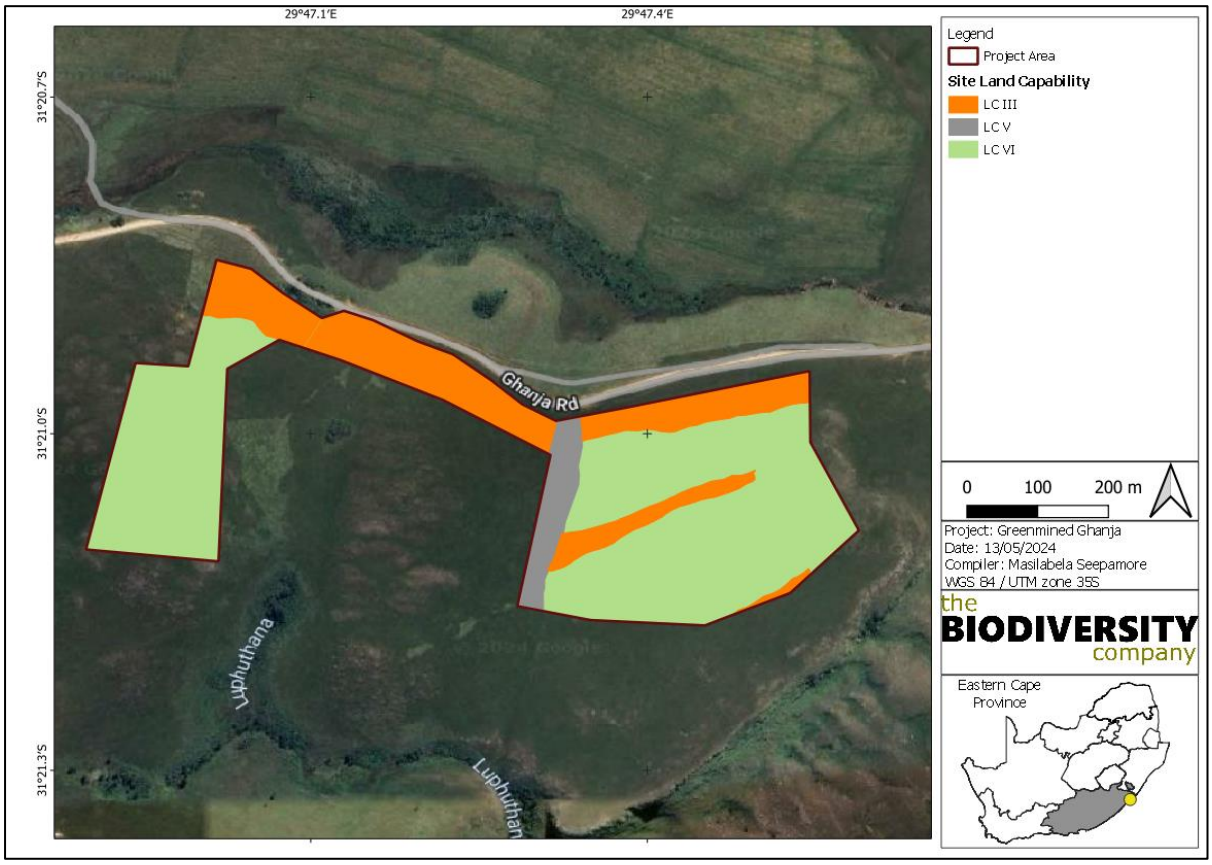


Figure 4-4 Site land capability of the dominant soil forms identified in the proposed project area

4.4.3 Land Potential

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 III were the reduced to a land potential level 4, land capability class V was reduced to Vlei areas, land capability class VI was reduced to land potential level 6, due to climatic limitation. 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
Avalon	4
Tshiombo	4
Oakleaf	4
Glenrosa	4
Fernwood	Vlei
Mispah	6

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.** Regular and/or severe to moderate limitations due to soil, slope, temperature, or rainfall.	Medium
5	**Restricted potential.** Regular and/or severe limitations due to soil, slope, temperatures or rainfall.	Medium
6	**Very restricted potential.** Regular and/or severe limitations due to soil, slope temperature or rainfall. Non-arable.	Low
Disturbed	N/A	None

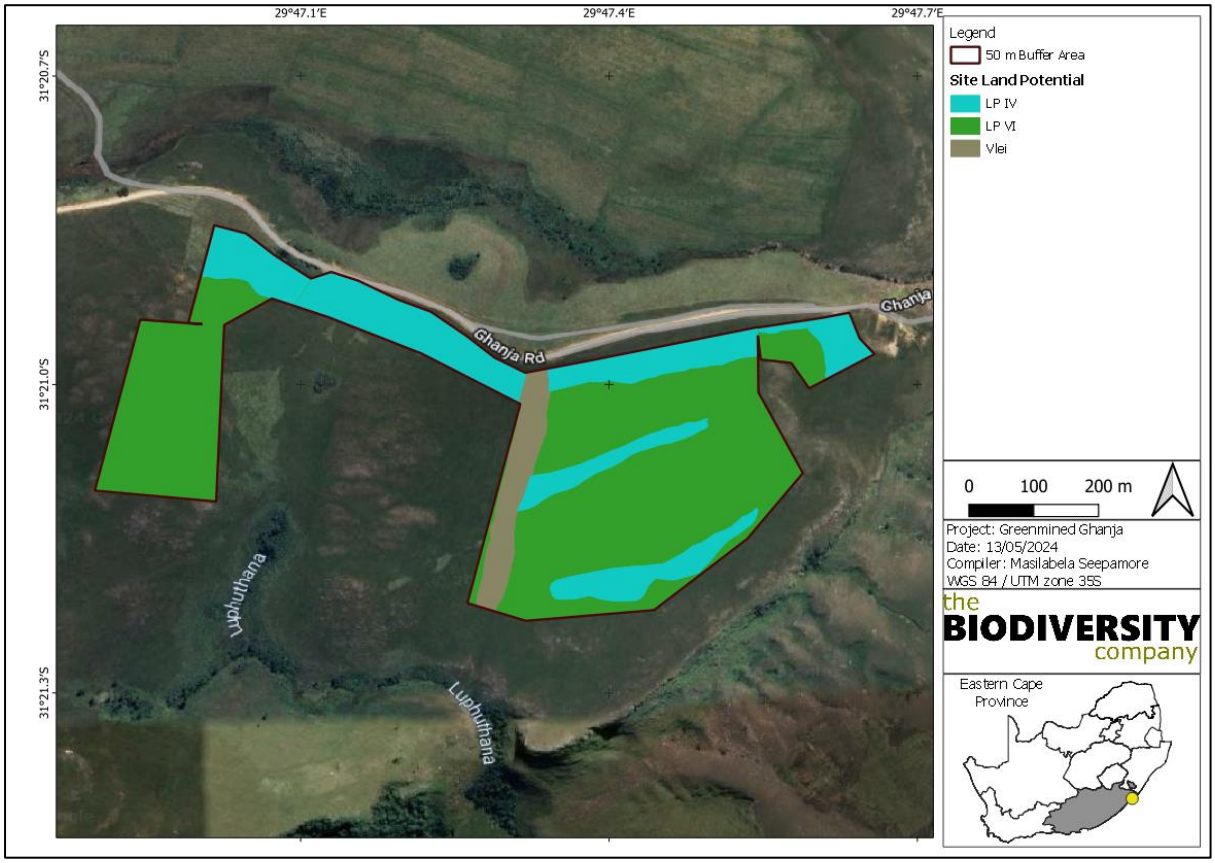


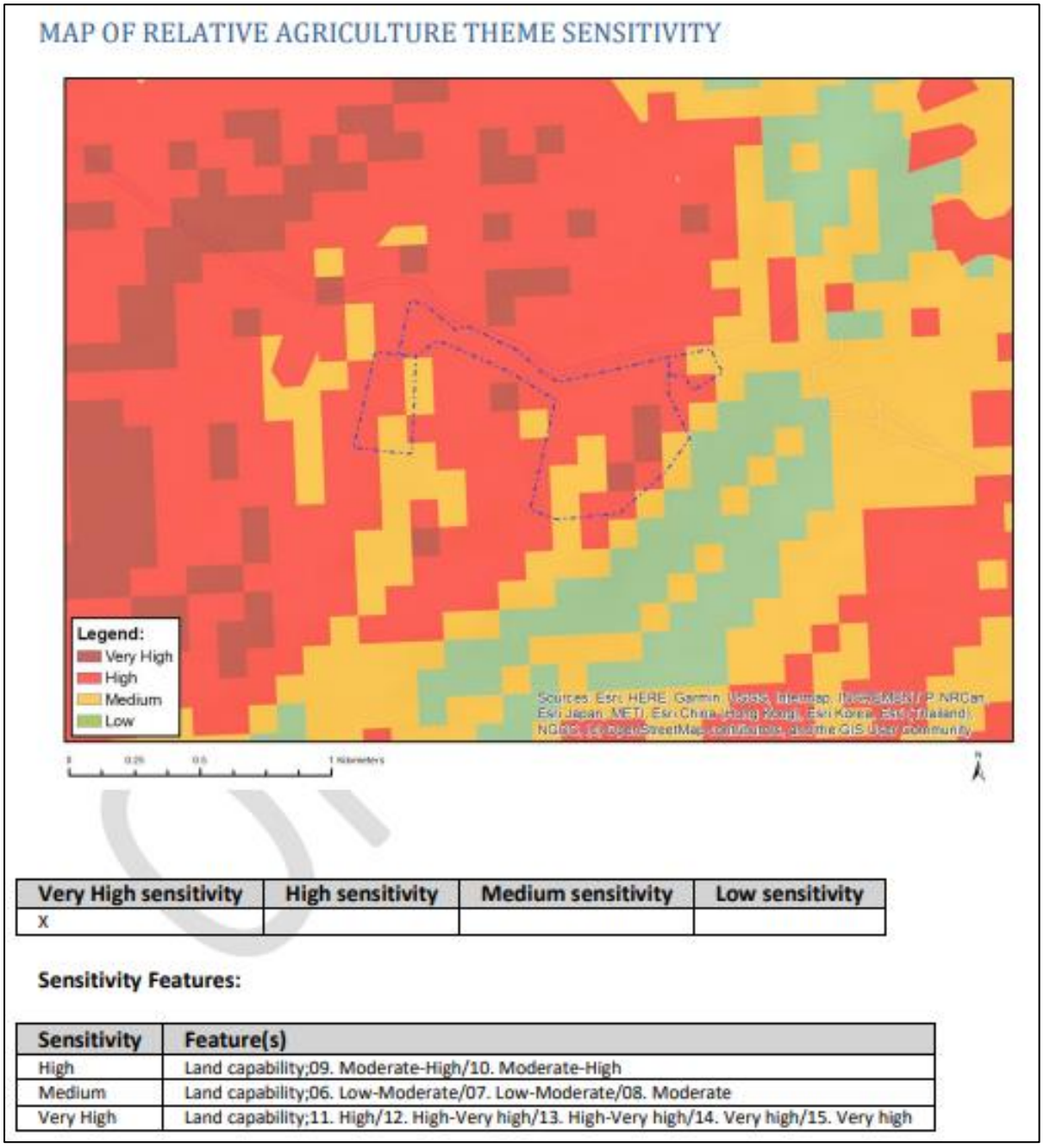
Figure 4-5 Site land potential of the dominant soil forms identified in the proposed project area

4.5 Sensitivity Verification

4.5.1 Screening Report –Ghanja Mining Project

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 proposed project area falls within the “Medium to Very High” agricultural sensitivity (Figure 4-6).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Land capability;11. High/12. High-Very high/13. High-Very high/14. Very high/15. Very high

Figure 4-6 Map of Relative Agricultural Theme Sensitivity for the Ghanja Mining Project and associated infrastructure assessment area

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which ten potential land capability classes are located within the proposed footprint area's assessment area, including;

- Land Capability 6 to 8 (Low Moderate Sensitivity to Moderate Sensitivity);
- Land Capability 9 to 10 (Moderate High Sensitivity); and
- Land Capability 11 to 15 (High to Very High Sensitivity).

The land capability dataset (DAFF, 2017) indicates a varied range of land capabilities expected throughout the project area. The project area is predominantly covered by "Moderate High" category, followed by "Low Moderate to Moderate", and isolated areas with "High to Very High" category (Figure

4-7). Furthermore, there were no crop field boundaries identified by means of the DFFE Screening Tool (2024), within the project area. The Ghanja mining project and infrastructure development areas coincide with moderate agricultural potential soils such as Tshiombo and Oakleaf forms. In addition, the development area also coincides low agricultural soils such as Mispah and Glenrosa forms. The slope of the project area also restricts most cropping practices under rainfed agriculture.

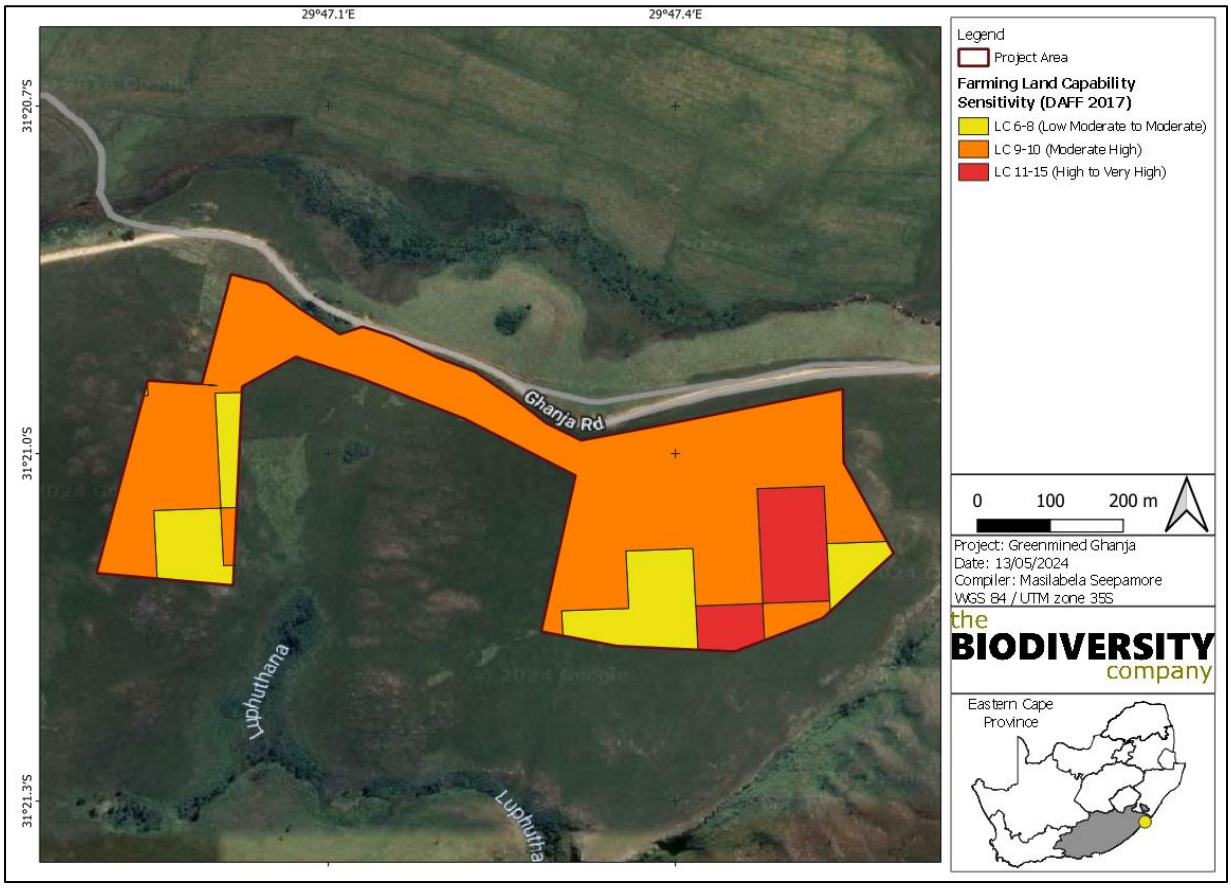


Figure 4-7 Land Capability Sensitivity (DAFF, 2017).

4.5.2 Site Ecological Importance (SEI)

The following land potential level have been determined:

- Land potential level 4 (this land potential level is characterised by moderate potential. Moderately regular and/or severe limitations due to soil, slope, temperatures, or rainfall). Appropriate permission is required before ploughing virgin land. Arable;
- Vlei; and
- Land potential level 6 (this land potential is characterised by regular and/or severe limitations due to soil, slope, temperature, or rainfall). Non-arable.

The climate, soil forms and land capability features were used to determine the sensitivity of resources relevant to this assessment. The “L4” areas were scored “Medium” sensitivity, and “L6” land potential areas were scored “Low” sensitivity”. Furthermore, the areas associated with the Glenrosa soil form were scored “Low” sensitivity while Vlei were assigned “Medium” sensitivity (Figure 4-8).

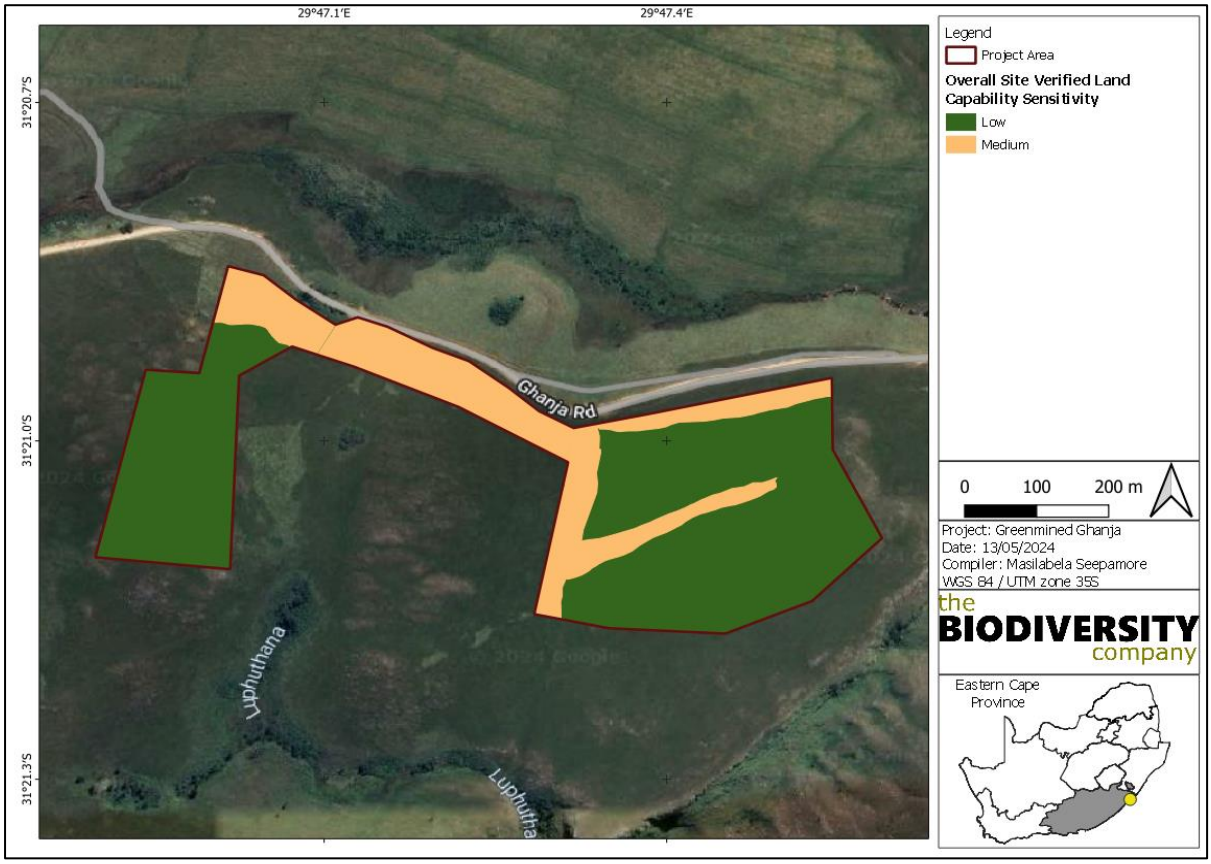


Figure 4-8 Overall Site Verified Land Capability Sensitivity.

Based on the confirmed sensitivities, the overall sensitivity of the proposed project area development footprints can be categorized as “Low”, with areas with “Medium” sensitivity. The allocated sensitivities for the theme are either disputed or validated in Table 4-8 below.

Table 4-8 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Theme	Screening Tool	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Agricultural Theme	Very High	Low	Disputed – Presence of low potential soil, such as Glenrosa and Mispah with limited soil profile which restrict profile water storage capacity, aeration, and drainage, and no active crop fields either under rainfed or irrigation condition.
	High	Medium	Dispute – Presence of low to moderate potential soils such as Tshiombo and Oakleaf which limit aeration, drainage and root penetration due to the periodic subsoil B2 saturation and increase in clay content.
	Medium	Low	Disputed – Presence of low potential soil, such as Mispah with limited soil profile which restrict profile water storage capacity, aeration, and drainage, and no active crop fields either under rainfed or irrigation condition.

4.5.3 Irreplaceable Loss

It is the specialist’s opinion that, if all best practice mitigation, rehabilitation, and monitoring guidelines be followed, the degradation and loss of soil resources can be minimised to an acceptable level. This statement is further backed by Land Rehabilitation Guidelines for Surface Coal Mines/Coaltech (2018), which mentions that soil resources that have been stockpiled for up to 20 years still proved a decent grow medium, if all stripping, stockpiling, remediation, monitoring and ongoing rehabilitation strategies are strictly adhered to.

4.5.4 Recommendations

The following recommendations are suggested:

- A soil stripping and stocking guideline for the proposed project must be compiled;
- A rehabilitation plan focussed on the ongoing rehabilitation and reseeding of stockpiles must be implemented; and
- A post-closure rehabilitation plan must be compiled taking into consideration the pre-mining baseline conditions stipulated in this report.

5 Conclusion

The most sensitive soil form found in the proposed project area include Avalon form with a land potential "L4" and ultimately a "Moderate" sensitivity due to the climatic conditions. The Tshiombo, Oakleaf and Fernwood soil forms were also identified within the project area and have "Medium" sensitivity. Moreover, the less sensitive soil forms including Glenrosa and Mispah forms are categorised as "Low" sensitive due their very restrictive permeability and inundated properties. The agricultural theme also indicates the presence of very high and high sensitive land capability soils within the project buffer development footprint. The baseline soil findings dispute the agricultural screening theme to an extent.

It is the specialist's opinion that the proposed development will have an overall low residual impact on the agricultural production ability of the land. There it is the specialist`s opinion that, the proposed development may be favourably considered and the implementation of mitigation measures to ensure low residual expected significant impacts occurrence.

5.1 Management Measures

An impact assessment is not required to be included in the Agricultural compliance statement, but where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr must be provided. The following measures are provided:

- Vegetation clearance must be restricted to areas authorised for development;
- Land clearing and preparation may only be undertaken immediately prior to construction activities and within authorised areas;
- A stormwater management plan must be developed and implemented for the project; and
- If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.

5.2 Statement Conditions

Authorisation of the project is subject to the availability of a concurrent rehabilitation plan, in consideration of closure objectives.

5.3 Layout Approval

It is the opinion of the specialist that the layout is acceptable and may be considered favourably for approval by the Competent Authority.

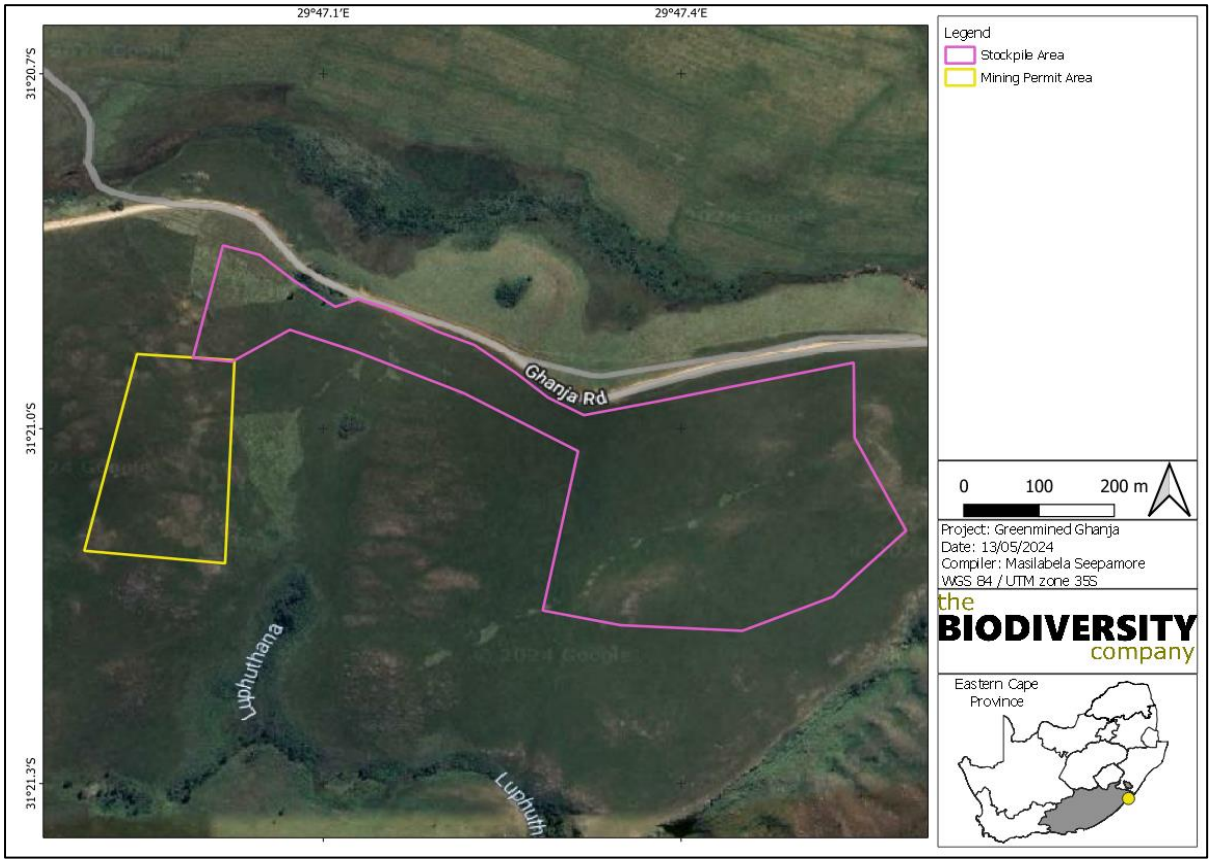


Figure 5-1 Layout for the proposed Ghanja Mining development

6 References

Department of Agriculture, Forestry and Fisheries, 2017. National land capability evaluation raster data: Land capability data layer, 2017. Pretoria.

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.

National Environmental Screening Tool. 2024. National Environmental Screening Tool, 2024. Available from the Department of Forestry, Fisheries and the Environmental website: https://screening.environment.gov.za/screeningtool/index.html#/pages/welcome

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.

7 Appendix Items

7.1 Appendix A: Methodology

7.1.1 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.

7.1.2 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.

7.1.3 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 7-1 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 7-1 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.

Table 7-2 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 7-3 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 7-4), 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 7-1). 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 7-4 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	

7.2 Appendix B Specialist declarations

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 71 and is punishable in terms of Section 24F of the Act.

Dr Matthew Mamera

Soil Scientist

The Biodiversity Company

May 2024

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 71 and is punishable in terms of Section 24F of the Act.

Masilabela Seepamore

Agricultural Scientist

The Biodiversity Company

May 2024

7.3 Appendix C Curriculum vitae

Matthew Mamera

PhD Soil Science (*Cand Nat Sci*)

Cell: +27 785 772 668
Email: matthew@thebiodiversitycompany.com
Identity Number: 8810315983183
Date of birth: 31 October 1988

Profile Summary

Working experience throughout South Africa

Specialist experience with pedology and agriculture.

Specialist expertise include hydropedology, pedology, land contamination, agricultural potential, land rehabilitation, rehabilitation management and wetlands resources.

Experience hydropedological modelling

Areas of Interest

Mining, Farming, Soil and Water quality contamination, Soil Sanitation management, Soil Carbon, Sustainability and Conservation.

Key Experience

- Environmental Impact Assessments (EIA)
- Environmental Management Programmes (EMP)
- Wetland delineations
- Rehabilitation Plans
- Soil taxonomic classification (SA forms and WRB groups)
- Soil Hydropedology assessments
- Agriculture potential assessments
- Land contamination assessments

Country Experience

South Africa: All Provinces

Zambia - Kitwe and Mufulira

Angola- Zenza – Cacuso; Luena – Saurimo

Namibia

Nationality

South African Permanent Residence

Languages

English – Proficient

Ndebele, Xhosa, Shona – Proficient

Qualifications

- PhD (University of the Free States)- Soil Science (Hydropedology, Sanitation and Water quality management)
- MSc (University of Fort Hare) – Soil Science (Hydropedology, Sanitation and Water quality management)
- BSc Honours *Cum laude* (University of Fort Hare) – Soil Science (Hydropedology, wetlands delineation and rehabilitation)
- BSc Agricultural Soil Science
- Cand Nat Sci 116356
- SSSSA- SSSSA 201

Masilabela Klaas Seepamore

MSc Soil Science (*Cand Nat Sci*)

Cell: +27 788151878
Email: masilabela@thebiodiversitycompany.com
Identity Number: 8806085781088
Date of birth: 08 June 1988

Profile Summary

Working experience in South Africa

Specialist experience with soil science, agronomy and agrometeorology.

Specialist expertise include production agronomy, Soil classification, fertilizer recommendation, Input planning, trial management, data analysis and crop modelling.

Areas of Interest

Farming, resource use efficiency production agronomy, soil classification, soil and crop research, climate change adaptation and mitigation strategies,

Key Experience

- Land suitability studies and report writing
- Soil taxonomic classification SA forms
- Fertilizer recommendation
- Crop research
- Data analysis
- Farm visit
- Technology transfer

Country Experience

South Africa

Nationality

South African

Languages

English – Proficient

Setswana, Sesotho – Proficient

Qualifications

- BASOS-FACTS Course (FERTASA)
- MSc Agriculture *Cum laude* (University of the Free State) – Soil Science (soil science, agronomy, and production agronomy)
- BSc Agriculture Honours (University of the Free State) – Soil Science (soil science, agronomy, crop nutrition)
- BSc Agricultural Agronomy and Soil Science
- Cand Nat Sci 113907

7.4 Appendix G: Alternatives Desktop Assessment

Based on the assessment undertaken in this report it was found that the Initial Stockpile Area is not a viable site for development purposes and as such alternative sites had to be considered. Following this, two site alternatives site for the stockpile area were provided by Greenmined (2024) and has been assessed on a desktop basis (Figure 7-1).

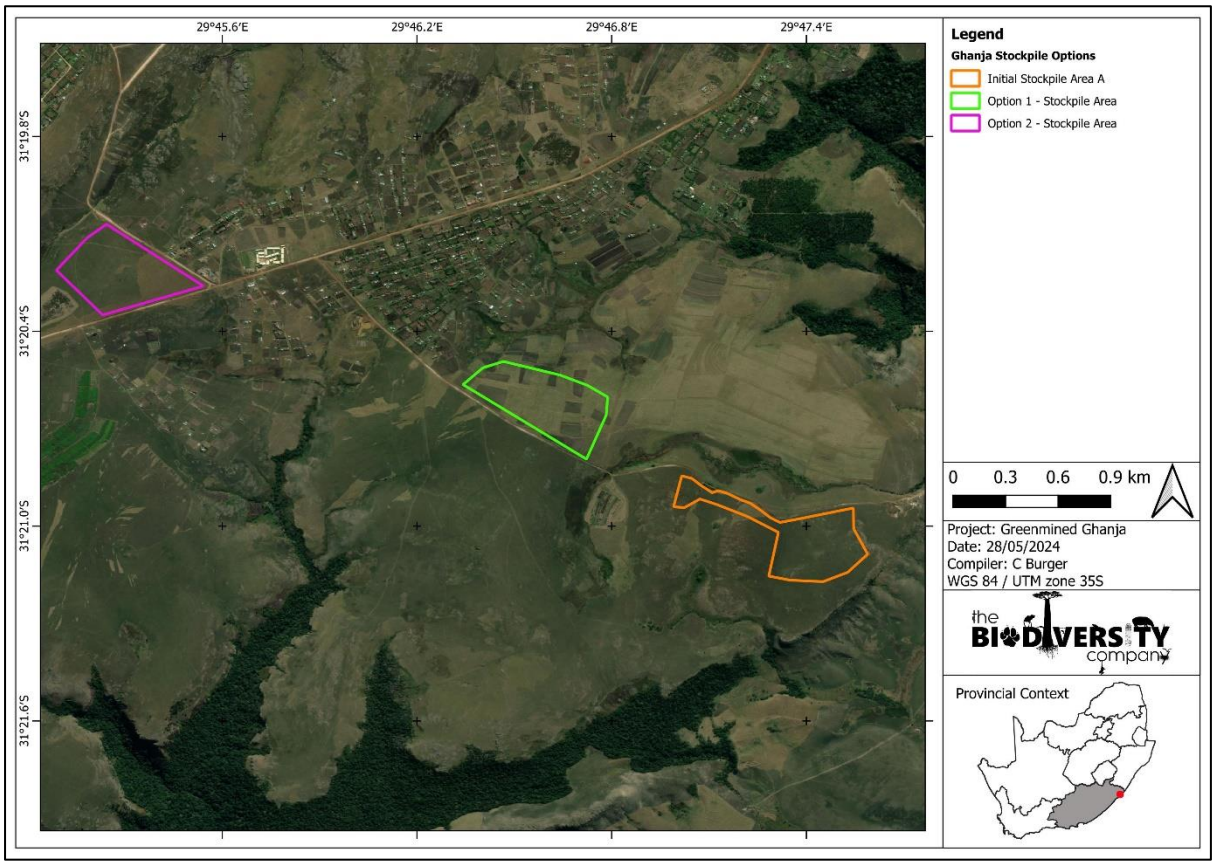


Figure 7-1 Map illustrating the Stockpile Alternatives

7.4.1 Desktop Assessment

7.4.1.1 Climate

The options fall within the Pondoland-Ugu Sandstone Coastal Sourveld vegetation. It is characterised with strong summer rainfall with some rain in winter and no or very infrequent incidence of frost. The area has a MAP ranging is approximately 1075 mm (Mucina & Rutherford, 2006). This is similar to what has been presented for the Initial Stockpile Area.

7.4.1.2 Geology & Soils

The geology of the Initial Stockpile Area and Option 1 is described as quartzite sandstone of the Natal Group. The total extent of these two options is characterised by the Ad land type. The geology of Option 2 is described as sandstone of the Natal Group. The extent of this options is characterised by the Aa and Ad land type.

The Ad 47 land type mainly consists of Clovelly and Oakleaf soil forms according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Ad land type is also characterised by red-yellow apedal, freely drained soils; yellow, dystrophic and/or

mesotrophic. The land terrain units for the featured Ad 47 land type are illustrated in Figure 3-3 with the expected soils listed in Table 3-1.

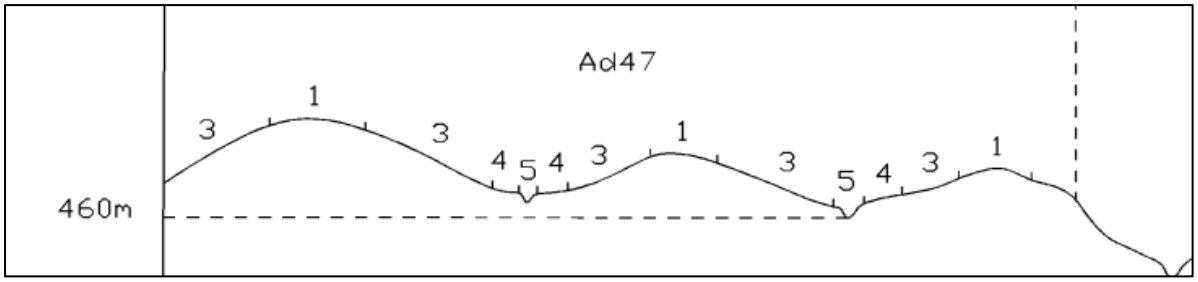


Figure 7-2 Illustration of land type Ad 47 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 7-5 Soils expected at the respective terrain units within Ad 47 land type (Land Type Survey Staff, 1972 – 2006)

Terrain units							
1 (25%)		**3 (70%)**		**4 (3%)**		**5 (2%)**	
Clovelly	35%	Clovelly	20%	Clovelly	70%	Oakleaf	55%
Mispah	20%	Mispah	20%	Cartref	10%	Stream Beds	40%
Magwa	20%	Magwa	20%	Oakleaf	10%	Bare Rocks	5%
Cartref	10%	Bare Rocks	20%	Mispah	5%		
Bare Rocks	10%	Cartref	10%	Bare Rocks	5%		
Glenrosa	5%	Glenrosa	5%				
		Inanda, Hutton	5%				

The Aa 27 land type mainly consists of the Kranskop soil form according to the Soil classification working group (1991), with the occurrence of other soils within the landscape. The Aa land type is also characterised by red-yellow apedal, freely drained soils; a humic horizon. The land terrain units for the featured Ad 47 land type are illustrated in Figure 7-3 with the expected soils listed in Table 7-6.

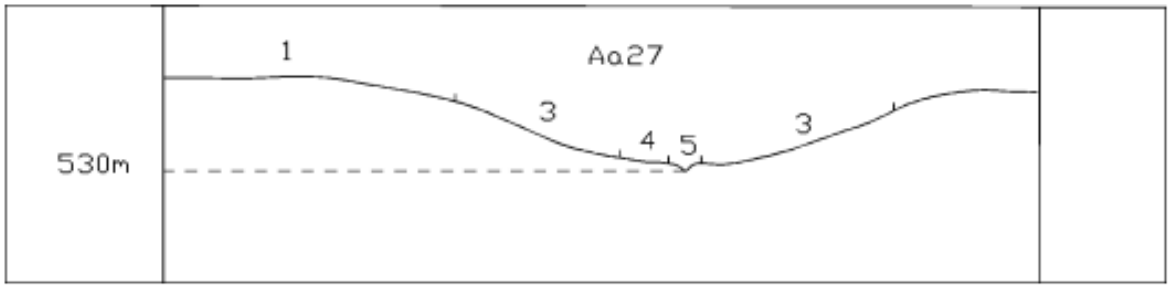


Figure 7-3 Illustration of land type Aa 27 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 7-6 Soils expected at the respective terrain units within Aa 47 land type (Land Type Survey Staff, 1972 – 2006)

Terrain units							
1 (50%)		**3 (40%)**		**4 (5%)**		**5 (5%)**	
Kranskop	73%	Kranskop	84%	Kranskop	20%	Katspruit	40%
Mispah	12%	Mispah	2%	Katspruit	30%	Champagne	30%
Mayo	4%	Mayo	5%	Nomanci	20%	Stream Beds	30%
Nomanci	7%	Nomanci	5%	Champagne	30%		
Hutton	4%	Hutton	4%				

7.4.2 Conclusion

It is the specialist's opinion that either option is feasible, and no fatal flaws are expected for the project. In the event either option, notably Option 1 is developed and there is a loss of crop or livestock agriculture, landowner compensation is likely to be required for the loss of agricultural activities.

The Agriculture Theme Sensitivity for all three options is similar and falls within the "Medium to Very High" agricultural sensitivity range.