Agricultural Potential Assessment - Proposed Kalabasfontein Coal Mining Project Extension

Mpumalanga Province, South Africa

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CLIENT

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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 Ecological Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests 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.	

EXECUTIVE SUMMARY

GNR 326	Appendix 6 (n): Specialist Opinion
The two shaft areas are of main concern, given the fact that these two alternatives are associated with the five situations that have been determined to have "Moderate (negative)" significance ratings post-mitigation. However, according to the mitigation hierarchy, if avoiding or minimising impacts are not possible (as in the case of these five situations), rehabilitation will be required to ensure that soil resources are not lost or degraded. In addition, it is the specialist's opinion that impacts to soil resources by means of underground mining activities and that the construction/operation of the proposed power line are minimal and that rehabilitation will be sufficient in ensuring that soil resources are not lost in the case of the two shaft areas. The preferred shaft currently is located within a "Class III" land capability class with the alternative shaft being located within a "Class IV" and "Class V" land capability class. It is recommended that the shaft rather be constructed in the "Class IV" land capability class area in the vicinity of the alternative shaft.	

Forzando Coal Mines (Pty) Ltd has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) to act as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment for the proposed Kalabasfontein project. An application for the amendment to the existing Mine Works Programme (MWP) and EMPR, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, therefore, required to support an application for environmental authorisation (EA). A water use licence application (WULA) for the relevant water use triggers associated with the proposed project will also be undertaken. The Biodiversity Company (TBC) was appointed by EIMS to conduct the agricultural potential assessment survey and impact assessment for the proposed project.

The purpose of the specialist study is to provide relevant input into the EIA process and to provide a report for the proposed activities associated with mining and ancillary activities proposed to take place on site.

According to desktop studies, the project area is non-uniform with sudden increases in slope percentage up to 30%. Thirteen (13) soil forms have been identified within the project area during the site visit. These soil forms, depending on clay percentage, depth, rock percentage and surface crusting have been assigned land capability classes, of which four (4) classes have been classified (Class II, III, IV and V). These classes have then been assigned land potential classes given the climatic and land capability conditions, of which three (3) have been identified (L2, L3 and "Vlei").

The project area is approximately 1500 ha in size with agriculture taking up approximately 50% of the total land use, wetlands taking up approximately 35%, natural veld taking up roughly 10% and built-up areas taking up approximately 5% of the project area.

DOCUMENT GUIDE

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed:

GNR 326	Description	Section in the Report
Specialist Report		
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page i
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iv
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 3
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 5
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10 & 11
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
Appendix 6 (f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a, site plan identifying site alternatives;	Section 9
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 13
Appendix 6 (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 9
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity **[including identified alternatives on the environment]** or activities;	Section 11
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 12
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 12 & 13
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None
Appendix 6 (n)	A reasoned opinion— i. **[as to]** whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 14.1
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	None
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6 (q)	Any other information requested by the competent authority.	None

DECLARATION

I, Ivan Baker, 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.

Ivan Baker

Soil Specialist

The Biodiversity Company

25th October 2018

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1. Introduction & Background

Forzando Coal Mines (Pty) Ltd. applied to the Department of Mineral Resources (DMR) for the conversion of Old Order Mining Rights to New Order Mining Rights for its mining operations at the Forzando North Shaft and Forzando South Shaft. These conversions were granted in November 2011 and executed on 28 June 2013.

This application is for the extension of the current mining areas (under Section 102 of MPRDA (Act No. 28 of 2002)) by inclusion of contiguous areas which are held under Prospecting Rights 1035PR & 1170PR. Through an intensive drilling exercise on these areas, economically viable blocks of coal have been defined. The plan is to access these newly defined blocks of coal from the existing Forzando South incline. Underground mining has been selected as the appropriate mining method for the Kalabasfontein project.

Annexation of these Prospecting Rights into the existing Forzando South Mining Right is motivated by subsequent reduction of Reserves at Forzando North Shaft. This diminution is as a result of unexpected poor ground conditions as well as burnt coal (Forzando Coal Mines (Pty) Ltd. 2018).

Kalabasfontein project area is situated in Mpumalanga, 20 kilometres (line of sight) north of Bethal and 20 kilometres east of Ga-Nala (Kriel). It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality. The project area comprises two Prospecting Rights, 1035PR & 1170PR, which covers a total area of ~1 547.8296ha over portions 7, 8, Remaining Extent (RE), 11 and 13 of the farm Kalabasfontein 232 IS. As part of the Kalabasfontein project, two alternative sites have been proposed for a new ventilation shaft, namely Portion 7 of the farm Uitgedacht 229 IS and Portion 22 of the farm Uitgedacht 229 IS. Initial granting of both Prospecting Rights was in 2006 to Forzando Coal Mines (Pty) Ltd. Subsequent to this, in respect of 1035PR and before the right could lapse on the 2nd of November 2009, a Prospecting Rights renewal was applied for in October 2009. In respect of PR 1170 the renewal was applied for on 12 January 2011 before the right could expire on 9 April 2011. Both renewals were granted on the 31st July 2015 with execution finalised on the 27th October 2015, extending the validity of both Prospecting Rights to the 30th of July 2018. The proposed extension of the current mining area will require minimal new surface infrastructure as the mining method to be employed is underground mining and existing surface infrastructure from the Forzando South mine will be used.

Forzando Coal Mines (Pty) Ltd has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) to act as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment for the proposed Kalabasfontein project. An application for the amendment to the existing Mine Works Programme (MWP) and EMPR, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, therefore, required to support an application for environmental authorisation (EA). A water use licence application (WULA) for the relevant water use triggers associated with the proposed project will also be undertaken. The Biodiversity Company (TBC) was appointed by EIMS to conduct the agricultural potential assessment survey and impact assessment for the proposed project.

One wet-season soil survey was conducted in October 2018. The survey was conducted by one soil specialist over a total period of three days.

The purpose of the specialist study is to provide relevant input into the EIA process and to provide a report for the proposed activities associated with mining and ancillary activities proposed to take place on site.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, 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.

1.1 Project Area

The Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal and 20 kilometres (line of sight) east of Ga-Nala (Kriel). It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality, (Figure 1).

As part of the Kalabasfontein project, two alternative sites have been proposed for a new ventilation shaft, namely Portion 7 of the farm Uitgedacht 229 IS and Portion 22 of the farm Uitgedacht 229 IS. Land use in the considered catchments consists predominantly of grassland areas, wetlands, farmsteads and irrigated agriculture as well as the urban footprint of the town of Bethal.

The project area covers a total area of approximately 1 547.83 hectares in separate blocks over a number of properties and farm portions. The abovementioned properties will be mined sequentially, commencing with portions 7, 8, remaining Extent (RE), 11 and 13 on the farm Kalabasfontein 232 IS. The two alternative shaft sites are located on portion 7 of the farm Uitgedacht 229 IS and portion 22 of the farm Uitgedacht 229 IS.

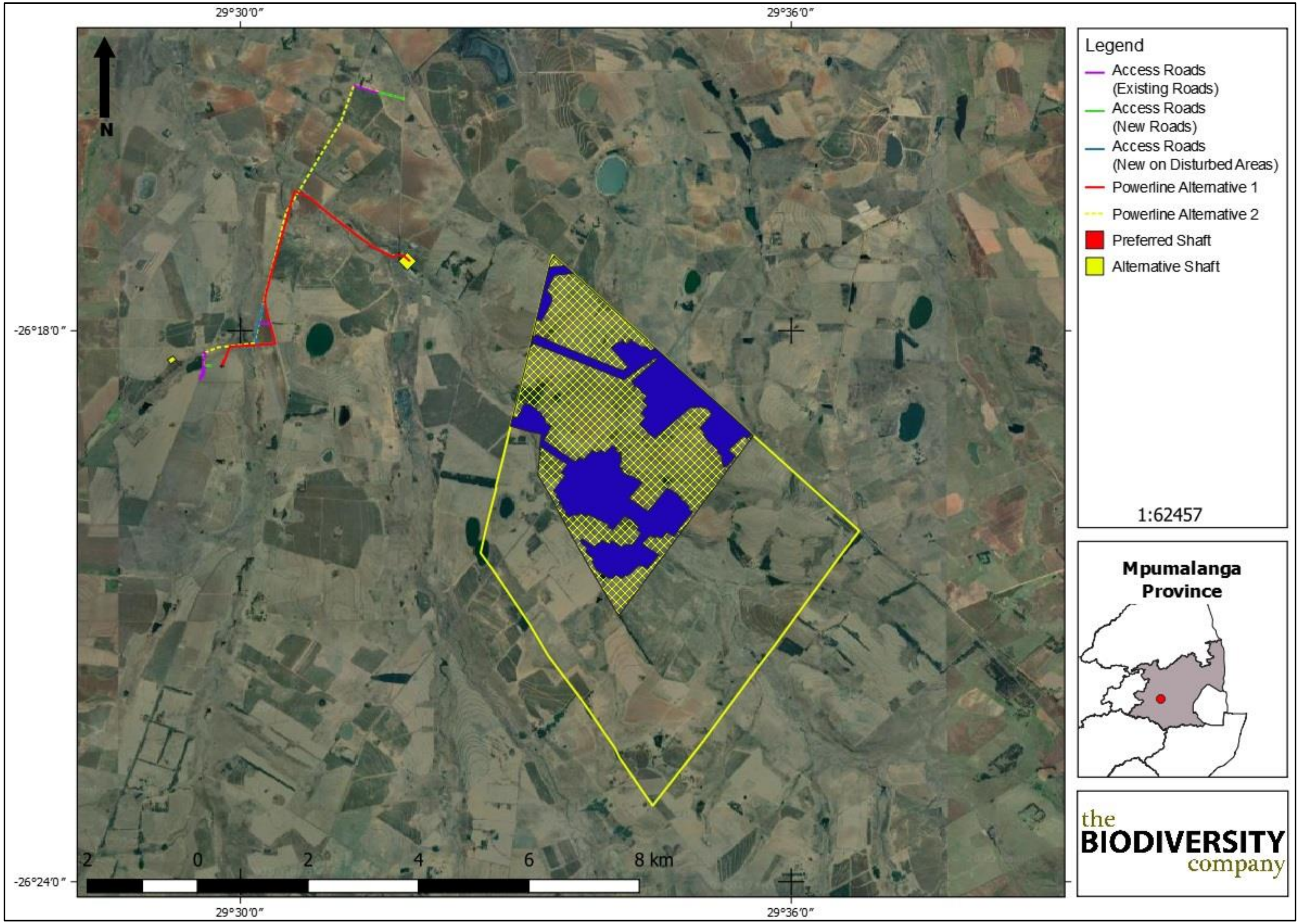

Figure 1: The proposed Kalabasfontein project area

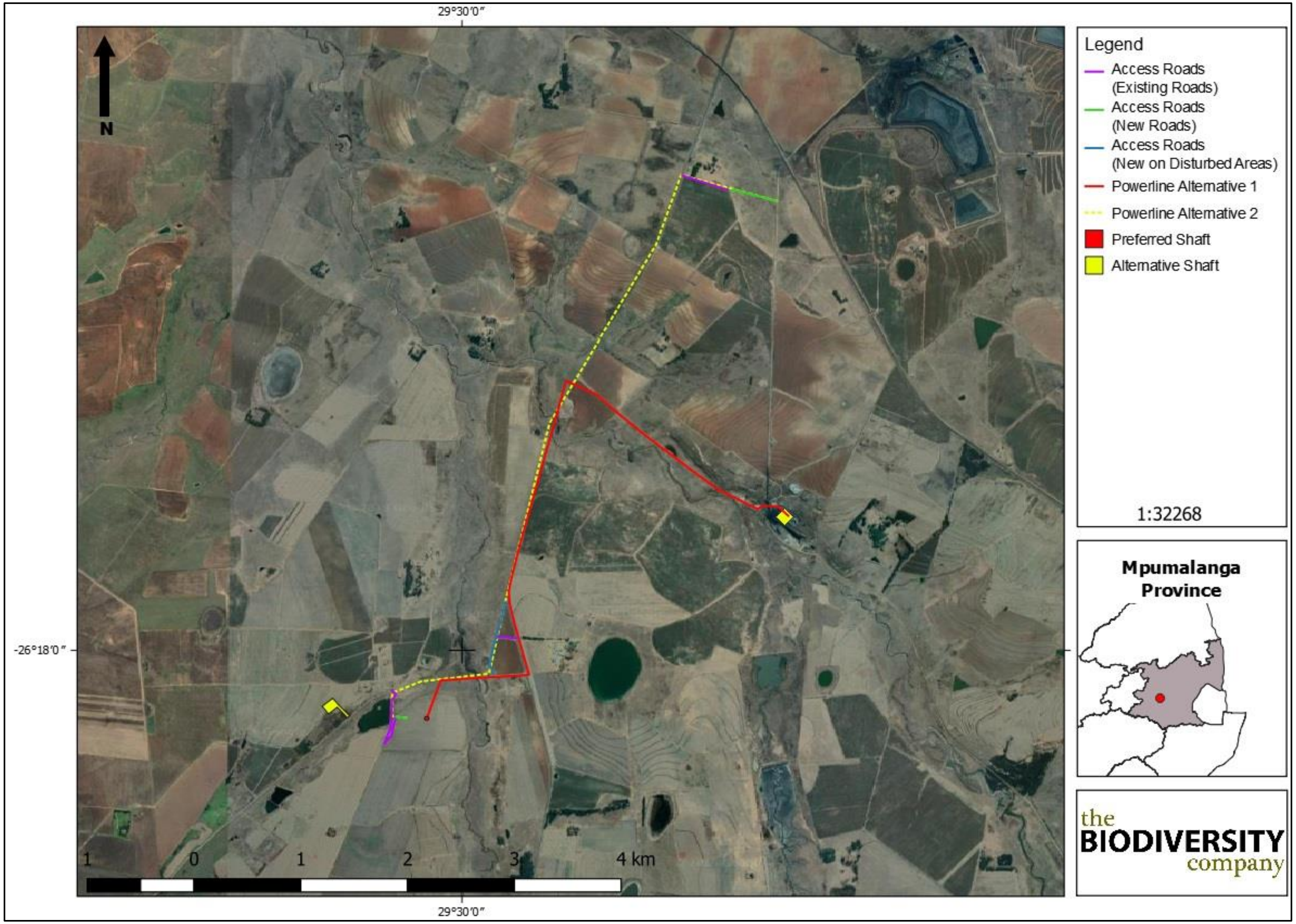

Figure 2: Extent of proposed powerlines, proposed shafts and access roads

2. Project Description

This section provides a detailed project description. The aim of the project description is to indicate the activities that are planned to take place at the Forzando South operations as well as the proposed Kalabasfontein project area and amendments that are being applied for in this application. Furthermore, the detailed mine/project description is presented to facilitate the understanding of the project related activities which result in the impacts identified and assessed and for which management measures have been proposed.

2.1 Mining Operations Overview

Although Kalabasfontein annexation is intended to extend the Life of Mine (LOM) of Forzando South Coal Mine, it will come into production a year after the annexation is granted by the DMR. The Kalabasfontein project has an estimated LOM of 17 years with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force. Mining in the Kalabasfontein project area is based on two Continuous Miner (CM) sections.

The access corridor to Kalabasfontein Reserves was identified during exploration drilling. Reserves will be mined through access from one of Forzando South Reserves block. This will eliminate intense preparation work of developing a new incline, as there will be infrastructure available at the face.

Currently, Forzando South mine is scheduled until 2037. However, the Kalabasfontein portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently being mined. The mine will maintain its production rate of 2.2 Million tonnes (Mt) per annum. Commissioning of Kalabasfontein will not add to the production of Forzando South but will provide relocation areas for existing Forzando South sections. Since the Kalabasfontein project will be mined concurrently with Forzando South, production decline will be due to depletion of Reserves. In the second quarter of year 17 (2037), the first section will pull out and leave the one section to deplete the remaining Reserves.

2.2 Current Authorisations

The following rights, authorisations and approvals are currently in place and have been considered in the compilation of the report:

- Mining Right (MP380MR) dated 28 June 2013;
- Prospecting Rights (MP 30/5/1/1/2/1035PR) dated 31 July 2015;
- Prospecting Rights (MP 30/5/1/1/2/1170PR) dated 31 July 2015;
- Water Use Licence (04/B11A/A/ACGIJ/521) dated 19 July 2011;
- Amended Water Use Licence (04/B11A/A/ACGIJ/521) dated 15 June 2017; and
- Waste Licence (12/9/11/L180/6) dated 22 February 2010.

2.3 Infrastructure Requirements

Anticipated demand for water, power and the on-site infrastructure requirements is detailed in the mine works programme (MWP). These requirements are based on staff required over the production period for permanent employees and contractors. Water and electricity requirements for the construction of mine access (ventilation shaft) and surface infrastructure are temporary, lasting for approximately 12 months.

The Forzando North plant is designed to treat Run of Mine (ROM) of approximately 2.2 Million tons per annum (Mtpa). This will include coal from the proposed Kalabasfontein Project. The plant will be manned for operations on a 24 hour/day, 7 days/week basis, with the exclusion of statutory public holidays.

Below are plant design parameters used:

- A production of 10,000t per day;
- A production of 3,300t per shift;
- Feed to ROM bin (peak) of 3,600t per hour at 50mm Top Size;
- ROM material top size (mm): 350mm;
- Primary crusher feed: 1,200t per hour (peak);
- ROM stockpile surge capacity 10,000t (max): 4,500t (live);
- Overland conveyor design maximum and average of 1,125t/hr and 750t/hr respectively; and
- Conveyor operation: 2 shifts per day for 5 days a week.

2.4 Mining Method to be Employed: Underground Mining

Bord and pillar mining using CM's was selected as the primary extraction method. In bord and pillar mining, parallel roads are developed in the development direction. Perpendicular roads, called splits, are developed at predetermined intervals to the parallel roads (see Figure 4). These roads interlink, creating pillars. The roads mined concurrently are determined by the size of the pillars required to support the overburden above the coal seam and the length of the production equipment trailing cables.

Pillar size is determined by the safety factor formula; which is the pillar strength divided by the pillar load (mass of the overburden carried by the pillar). Panel design will be based on either the Probability of Failure (PoF) or the safety factor design criterion. A PoF of 0.1% or SF of 2.0 will be used for main development, whereas a PoF of 1% or SF of 1.6 will be used for production panels depending on the stability and rock engineering characteristics that will be determined by a Rock/Geotechnical Engineer. The dimensions of the roads and the support requirements are determined by a Geotechnical Engineer and documented in a code of practice for the prevention of roof falls.

2.5 Surface Infrastructure

As the Kalabasfontein project will use the existing Forzando South and Forzando North infrastructure, it is envisaged that additional infrastructure requirements will be minimal. A ventilation shaft will be required, this will be located outside the Kalabasfontein project area, either on portion 7 or portion 22 of the farm Uitgedacht 229 IS approximately 6km away.

2.6 Administration Buildings, Engineering Bays, Workshops and Other Buildings

As the Kalabasfontein project will be an extension of the Forzando South operations, it anticipated that the existing infrastructure will be utilized during all phases of the project. The existing surface infrastructure related to Forzando North can be summarised as follows:

- Coal beneficiation plant;
- Coal discard dumps;
- Rail line of about 1,6 km to the Richards Bay Coal Terminal railway line;
- Rail loop of about 400 m diameter;
- Coal product load-out stockpile located to the west of the discard dump;
- ROM coal stockpile;
- Water pollution control dams;
- Metallurgical coal stockpiles; and
- Administration, workshops, change house and related buildings.

At present the existing surface infrastructure related to Forzando South can be summarised as follows:

- Power lines;
- Ventilation shafts (one upcast & one downcast);
- ROM coal stockpile;
- Overland conveyor from boxcut to Forzando North plant;
- Water pollution control dams; and
- Administration, workshops, change house and related buildings.

3. Scope of Work

TBC was commissioned by EIMS to conduct an agricultural potential assessment for the proposed Kalabasfontein project. The Terms of Reference (ToR) for this study included the following:

- A soils study was conducted which includes a description of the physical properties which characterise the soil within the proposed area of development of the relevant portions of the property;
- The findings from the study were used to determine the existing land capability and current land use of the entire surface area of the relevant portions of the project area;

- Given the fact that the mine operations are underground, identification of soils were done in random patterns. Soil resources were analysed in areas where the relief, soil colour and/or physical properties change;
- The soil classification was done according to the Taxonomic Soil Classification System for South Africa, 1991. The following attributes must be included at each observation:
  - Soil form and family (Taxonomic Soil Classification System for South Africa, 1991);
  - Soil depth;
  - Estimated soil texture;
  - Soil structure, coarse fragments, calcareousness;
  - Buffer capacities;
  - Underlying material;
  - Current land use; and
  - Land capability.

4. Limitations

The following limitations should be noted for the study:

- The assessments were conducted on those portions of the project area as originally defined by the client, any changes in the project boundary subsequent to this may negatively impact the robustness of this report;
- Wetland delineations correlate with the findings presented within the recent wetland assessment carried out within the project area, (TBC, 2018); and
- The portion in the north-western corner of the project area was not assessed due to the fact that access could not be arranged for this portion. This portion has subsequently been removed from the project area (see Figure 3).

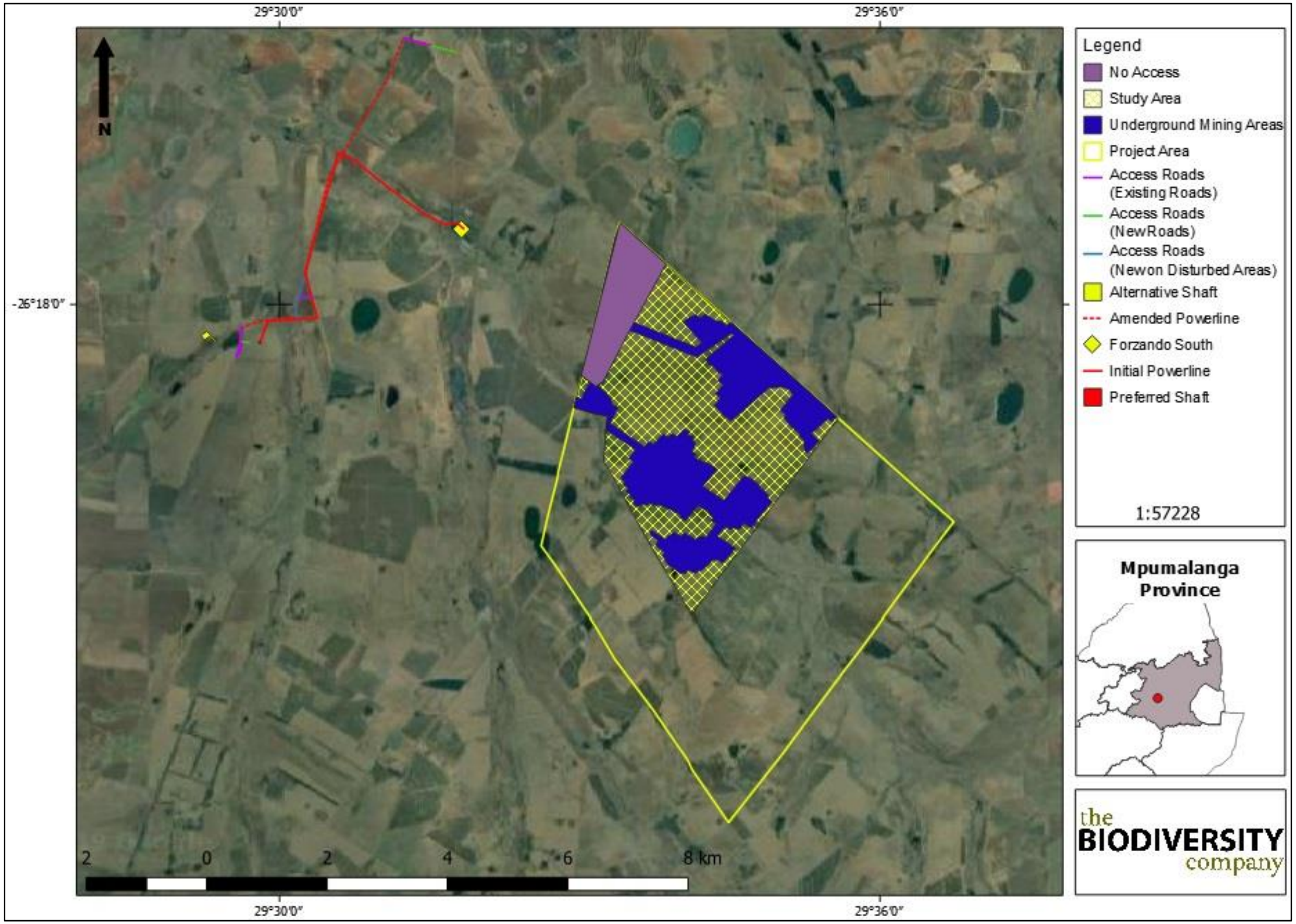

Figure 3: Extent of inaccessible area

5. Methodologies

The agricultural assessment was conducted using the Provincial and National Departments of Agriculture recommendations. The assessment was broken into two phases. Phase 1 was a desktop assessment to determine the following:

- Historic climatic conditions;
- The terrain features using 5m contours;
- The base soils information from the land type database (Land Type Survey Staff, 1972 - 2006); and
- The geology for the proposed project site.

Phase 2 of the assessment was to conduct a soil survey to determine the actual agricultural potential. During this phase the current land use was also surveyed.

5.1 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.

5.2 Field Survey

A study of the soils present within the project area was conducted during field visit in October 2018 and again on the 14th of June 2019 to assess the second alternative powerline. The site was traversed by vehicle and on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1.5 m. Soil survey positions were recorded as waypoints using a 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, 1991). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

5.3 Agricultural Potential Assessment

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

Land capability is divided into eight classes and these may be divided into three capability groups. Table 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 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 Table 2. The final land potential results are then described in Table 3.

Table 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 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

5.4 Current Land Use

Land use was identified using aerial imagery and then ground-truthed while out in the field. The possible land use categories are:

- Mining;
- Bare areas;
- Agriculture crops;
- Natural veld;
- Grazing lands;
- Forest;
- Plantation;
- Urban;
- Built-up;
- Waterbodies; and
- Wetlands.

6. Key Legislative Requirements

Currently, various pieces of legislation and related policies exist that guide and direct the land user in terms of land use planning both on a national and provincial level. This legislation includes, but is not limited to:

- The Constitution of the Republic of South Africa (Act 108 of 1996);
- Sub-division of Agricultural Land Act (Act 70 of 1970);
- Municipal Structures Act (Act 117 of 1998);
- Municipal Systems Act (Act 32 of 2000); and

- Spatial Planning and Land Use Management Act, 16 of 2013 (not yet implemented).

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).

7. Study Approach

This EIA report has been compiled in accordance with the accepted Plan of Study and incorporates the findings and recommendations from other specialist studies conducted for the project.

In addition, this EIA is being compiled according to the guidelines provided in GNR 326 of the EIA Regulations (2017).

All specialist studies were initiated on the basis of the conceptual layout plan indicating the proposed mining areas and mine infrastructure associated with the Kalabasfontein project, as provided by EIMS.

8. Project Area Description

8.1 Vegetation

The project area falls within the Eastern Highveld Grassland (Gm 12) vegetation type. This vegetation type is located in the Gauteng and Mpumalanga provinces within the plains between Belfast and Johannesburg. This vegetation type also extends to Bethal, the western areas of Piet Retief and Ermelo. The altitude in which this vegetation type occurs ranges between 1 520 meters above sea level to 1 780 meters above sea level(Mucina & Rutherford, 2006).

The vegetation of this vegetation type is characterised by short and dense grasslands that occur in moderately undulating plains which include low hills and pan depressions. Small scattered rocky outcrops are common in this area with wiry, sour grasses accompanied by some woody species which include *Celtis africana, Parinari capensis, Protea caffra* etc.

The conservation status of the Gm 12 vegetation type is endangered with a target percentage of 24. Half of the area is already transformed into agriculture, mining, urban etc. with a handful of conservation areas still up and running. These include Holkranse, Nooitgedacht Dam and Morgenstond (just to name a few).

8.2 Soils & Geology

According to Mucina & Rutherford (2006), the geology and soils aspect of the Gm 12 vegetation type is characterised by red to yellow sandy soils of the Ba and Bb land type. The geology of this region includes sandstone and shale of the Madzaringwe Formations (Karoo Supergroup).

According to the land type database (Land Type Survey Staff, 1972 - 2006) the project falls within the Bb 4 land type, which consists of plinthic catena. Upland duplex and margalitic soils are rare and dystrophic and/or mesotrophic red soils are not wide spread.

8.3 Climate

According to Mucina & Rutherford (2006), this region is characterised by a strongly seasonal rainfall, dry winters and a mean annual precipitation of approximately 726mm and is relatively uniform across the distribution of the Gm 12 vegetation type. Incidence of frost ranges between 13 to 42 days a year and occurs more at higher elevations, see Figure 4.

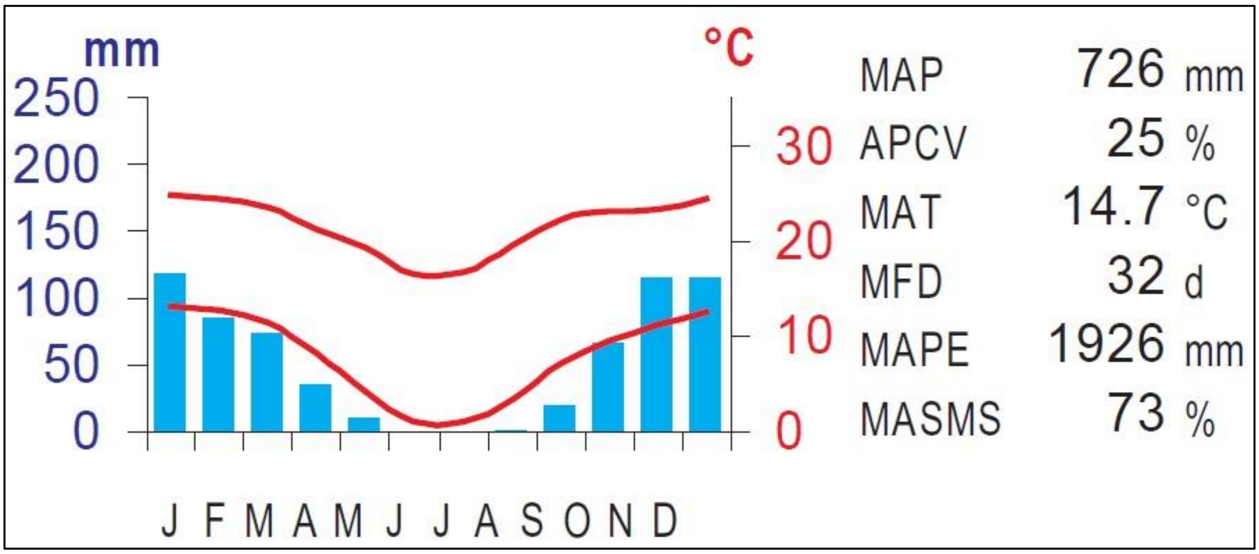

Figure 4: Climate for the project area, Mucina & Rutherford (2006),

9. Results & Discussion

The following sections include desktop results and the results from field observations relevant to the agricultural potential of the study area.

9.1 Desktop Assessment- Terrain

A National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) (V3.0, 1 arcsec resolution) Digital Elevation Model (DEM) was obtained from the United States Geological Survey (USGS) Earth Explorer website. Basic terrain analysis was performed on this DEM using the SAGA GIS software that encompassed a slope and channel network analyses in order to detect catchment areas and potential drainage lines respectively. The following processes have been considered for the desktop assessment:

- The relief map (Figure 5): The project area is non-uniform with an elevation range from approximately 1580 meter above sea level (masl) to 1700 masl. The lower laying regions are characterised by various signs of wetness including hydrophytes, wetland soils, historic signs of wetness and current signs of wetness.
- The slope map (Figure 6): The project area is non-uniform with slopes between 0% and 30% with some major height changes throughout the project boundaries which represents cliffs.
- The aspect map (Figure 7): The map shows that the entire project area is non-uniform and with an aspect facing towards north, south, east and west.

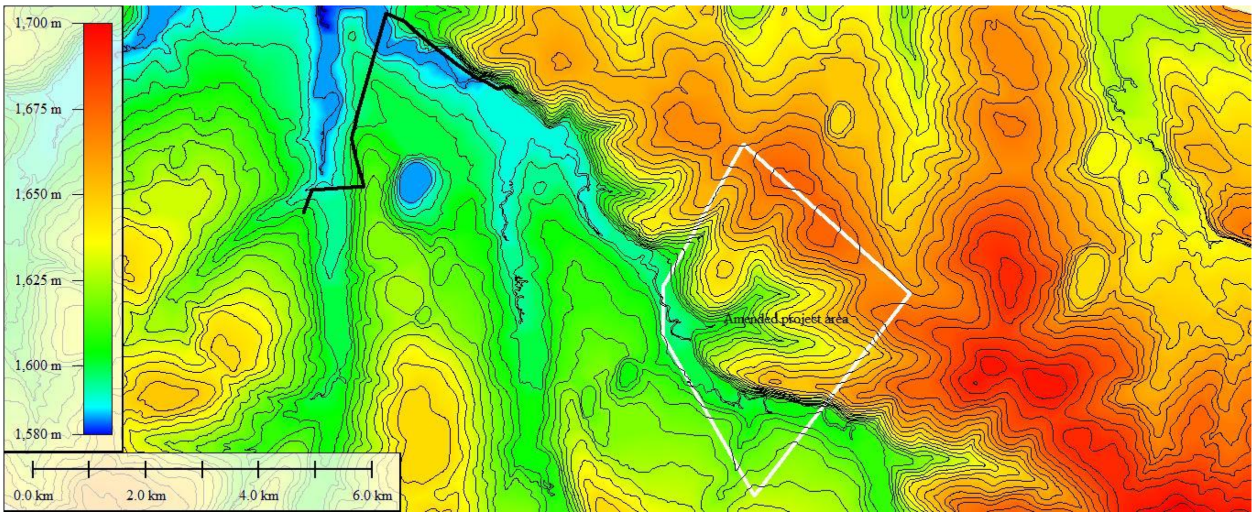

Figure 5: The relief map for the project area

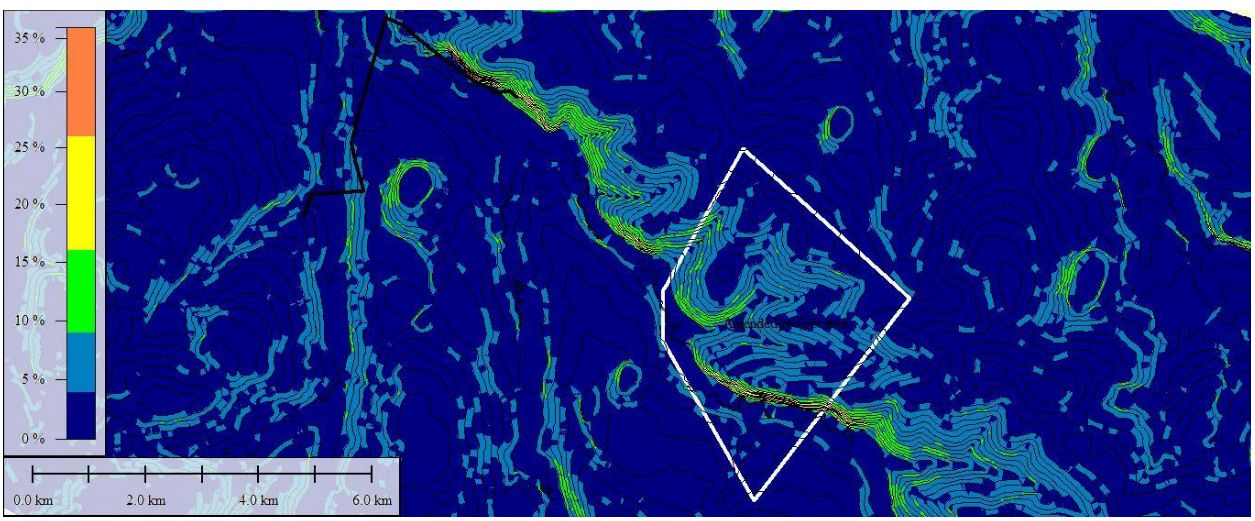

Figure 6: The Slope Percentage map for project area

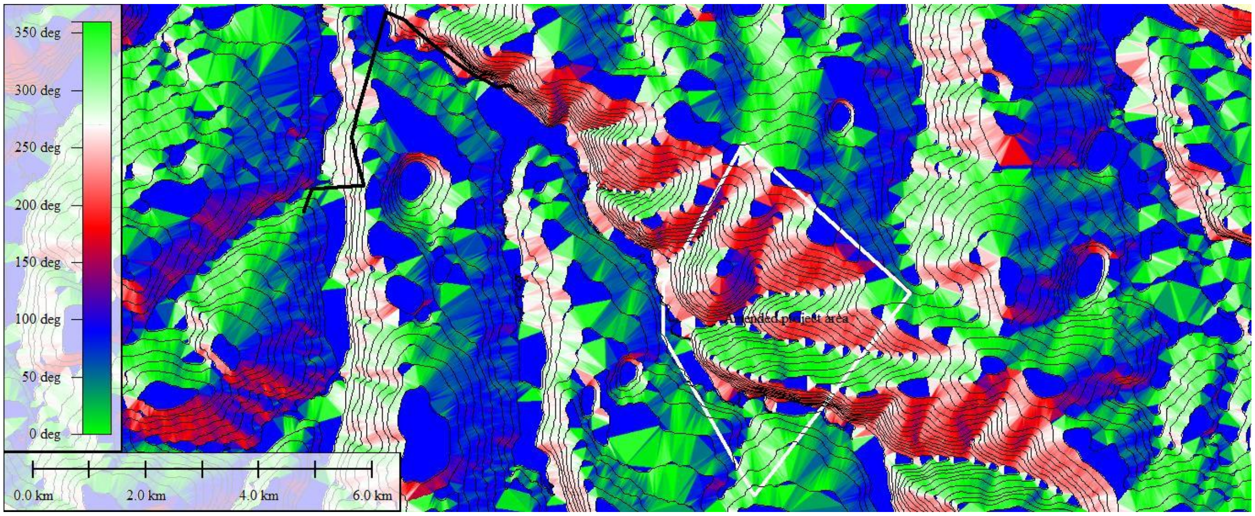

Figure 7: The Slope Aspect map for project area

9.2 Field Survey

9.2.1 Description of Identified Soil Profiles and Diagnostic Horizons

Soil profiles was sampled and studied up to a depth of 1.5m to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. The following diagnostic horizons were identified during the site assessment;

- Melanic A-horizon;
- Orthic A-horizon;
- Pedocutanic B-horizon;
- Litocutanic B-horizon;
- Hard rock;
- Unspecified material (with and without signs of wetness);
- E-horizon;
- Soft Plinthic B-horizon;
- Hard Plinthic B-horizon;
- Yellow-Brown Apedal B-horizon;
- Neocutanic B-horizon;
- Red Structured B-horizon; and
- Red Apedal B-horizon.

9.2.1.1 Melanic A-Horizon

A Melanic A-horizon is characterised by dark colours and well-structured blocky peds which is common in young landscapes. The parent geology of this soil horizon is intermediate or basic and can be very similar to Vertic clay due to a high clay percentage. Melanic clays distinctly have a high percentage of mica-like vermiculite and coalite clays rather than swelling smectic clays.

9.2.1.2 Orthic A-Horizon

These soils are termed as “normal” soils given the fact that this soil horizon does not have any diagnostic properties pertaining to other diagnostic soil horizons. The Orthic A-horizon does not have specific characteristics regarding colour, texture, base status etc. due to this diagnostic soil horizon’s wide range throughout South African Landscapes.

9.2.1.3 Hard Rock

This diagnostic horizon disallows the infiltration of water or root systems and occurs in shallow profiles. Horizontally layered, hard sediments without evidence of vertical seems fall under this category.

9.2.1.4 Unspecified Material

An unspecified material refers to a material that has diagnostic characteristics similar to an E-horizon, a G-horizon, a Litocutanic horizon etc., but is not expected to occur in a certain position within a given soil profile.

9.2.1.5 E-Horizon

The E-horizon is characterised by a leached colour and lacks the colour from the top soil and/or the soil horizon underneath the E-horizon. The E-horizon’s iron oxides and organic material has been leached out by lateral sub-surface flows, hence the grey colour and rough texture. Rusty marks (mottles) are common in E-horizons and indicate a temporary to seasonally saturated soil.

9.2.1.6 Soft Plinthic B-Horizon

The accumulations of iron (and in some cases manganese) as hydroxides and oxides with the presence of high chroma striations and concretions with black matrixes is associated with the Soft Plinthic B-horizon. This diagnostic horizon is a result of a fluctuating levels of saturation. The iron and manganese concentration results in soft marks within the soil matrix which transform in concretions with high consistencies.

If this process continues for long enough periods, a massive continues impermeable layer of hard plinthite forms. A Soft Plinthic B-horizon and a Hard Plinthic B-horizon can be distinguished from one another by means of a simple spade test. A Soft Plinthic B-horizon can be penetrated by means of a spade in wet conditions whereas a Hard Plinthic B-horizon cannot.

9.2.1.7 Hard Plinthic B-Horizon

Hard Plinthic B-horizon forms as a result of the ongoing processes involved in the formation of Soft Plinthic B-horizons and is also known as relic systems. This diagnostic horizon is impermeable by means of water and root systems.

9.2.1.8 Red Apedal B-Horizon

This diagnostic soil horizon has no well-formed peds, but rather small porous aggregates. The poor structure associated with this diagnostic profile is a result of weathering processes under well drained oxidising conditions. Iron-oxide precipitations form on the outside of soil particles (hence the red colour) and non-swelling clays dominate the clay particles. This diagnostic soil horizon is widely spread across South Africa and can be associated with any parent material.

9.2.1.9 Yellow-Brown Apedal B-horizon

The Yellow-Brown Apedal B-horizon is similar to that of the Red Apedal B-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.

9.2.1.10 Neocutanic B-Horizons

This diagnostic horizon is associated with recent depositions and unconsolidated soils. Any soil form can develop out of a Neocutanic B-horizon, depending on the climatic and topographical conditions. Some properties pertaining to other diagnostic soil horizons will be present within a Neocutanic B-horizon but will lack main properties necessary to classify the relevant soil type.

9.2.1.11 Red Structured B-Horizon

This diagnostic soil horizon is characterised by a well-developed structure and a constant red colour throughput the depth of the horizon. The structure associated with this soil type is a result of a high concentration 2:1 clay. The formation of this soil can be described by weathering of parent material rich in ferro-magnesium. Basic igneous rocks (basalt, dolerite, norite etc.) or metamorphic rocks (amphibolite, basic schist etc.) are usually associated with the weathering processes involved in the formation of Red Structured B-horizons.

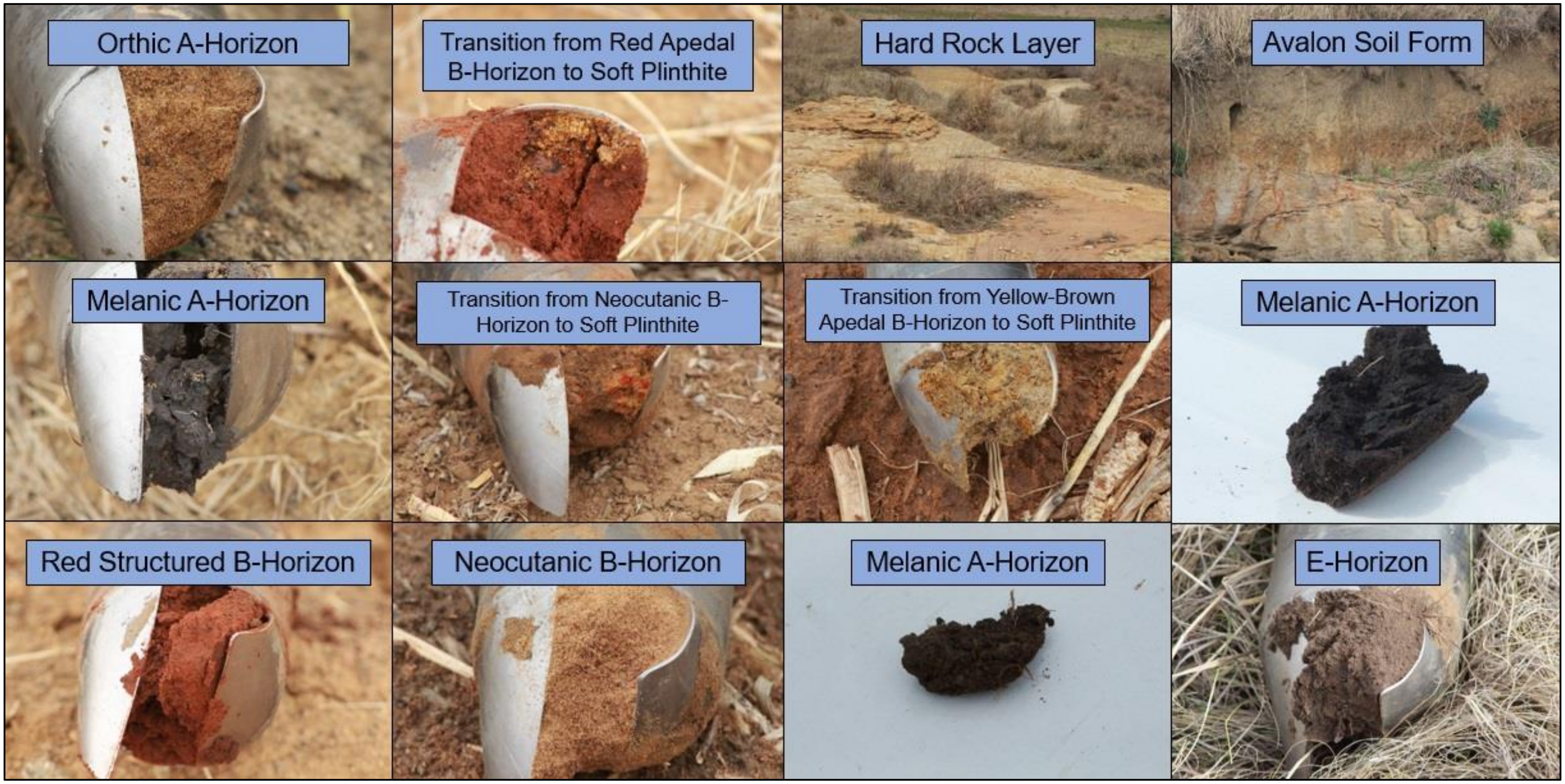

Figure 8: Soil characteristics identified within the project area

9.2.2 Description of Soil Forms and Soil Families

During the site assessment, various soil forms were identified. These soil forms have been delineated and illustrated in Figure 9 and described in Table 4 according to depth, clay percentage, indications of surface crusting, signs of wetness and percentage rock.

All of the hydromorphic soils identified have similar properties and depths and has therefore been labelled as "hydromorphic soils" rather than individual soil forms. More information about the hydromorphic soils and their properties are discussed in a recent wetland assessment of the project areas (TBC, 2018). The extent of the wetland areas has also been incorporated with the findings from that of the latter mentioned wetland assessment (TBC, 2018).

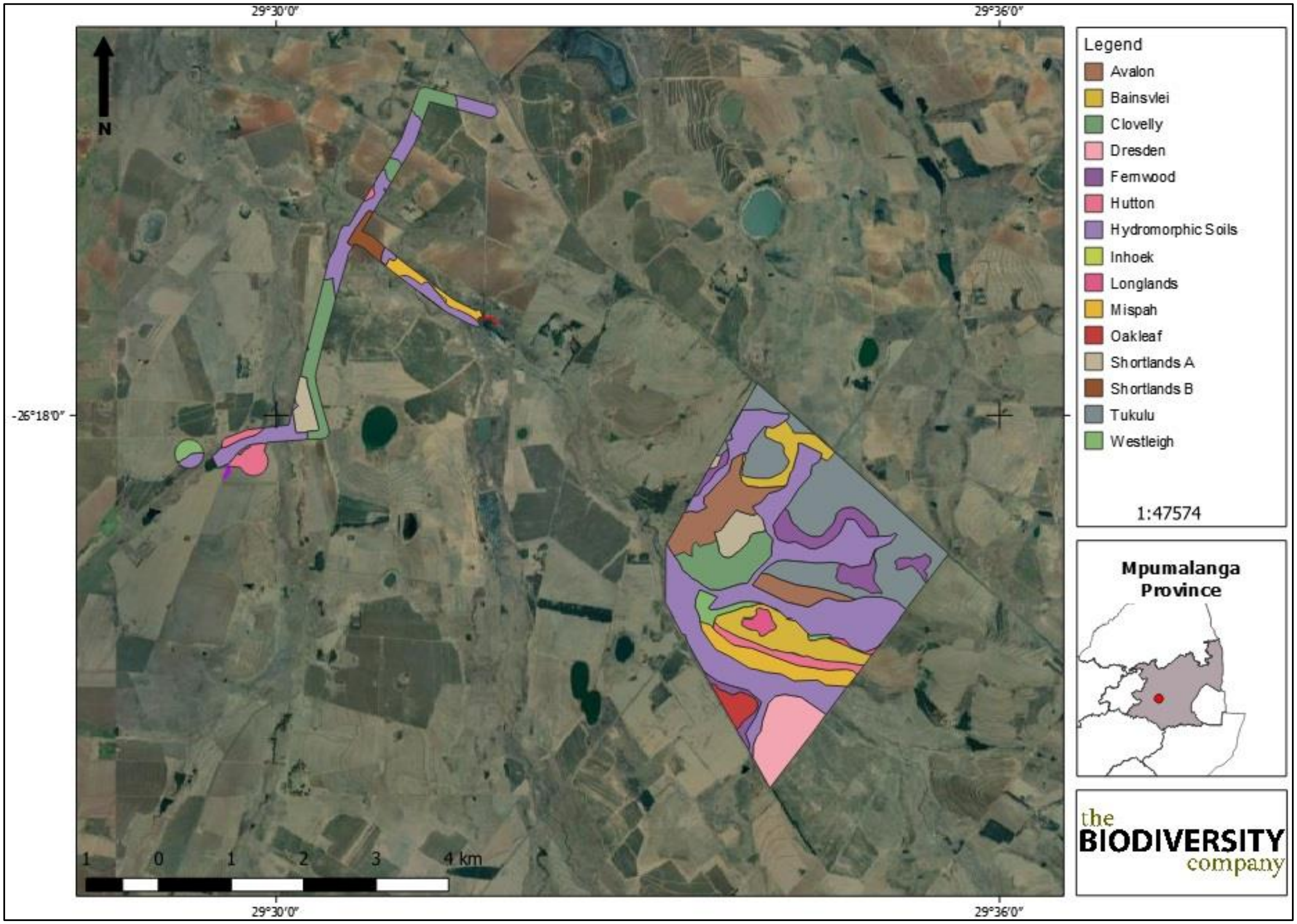

Figure 9: Soil delineations within the project area

Table 4: Summary of soils identified within the project area

	A-horizon					B-horizon				B-horizon/C-horizon			
	Depth (mm)	**Clay**	**Signs of wetness**	**Rock %**	**Surface crusting**	**Depth (mm)**	**Clay**	**Signs of wetness**	**Rock %**	**Depth (mm)**	**Clay**	**Signs of wetness**	**Rock %**
Dresden	600	0-15	None	0	None								
Mispah	300	0-15	None	0	None								
Westleigh	300	0-15	None	0	None								
Shortlands "A"	200	15-35	None	0	None	900	15-35	None	0	N/A			
Shortlands "B"	200	15-35	None	R3	None	300	15-35	None	0	N/A			
Clovelly	200	0-15	None	0	None	800	0-15	None	0	N/A			
Hutton	200	0-15	None	0	None	800	0-15	None	0	N/A			
Inhoek	200	>35	None	0	None	1000	15-35	None	0	N/A			
Longlands	200	15-35	W3	0	None	400	0-15	None	0	200	15-35	None	0
Hydromorphic soils	200	15-35	W3	0	None	300	0-15	None	0	400	>35	None	0
Tukulu	200	0-15	0	0	None	700	0-15	None	0	200	15-35	W1	R1
Fernwood	200	0-15	0	0	None	700	0-15	None	0	200	0-15	None	0
Bainsvlei	200	0-15	0	0	None	800	0-15	None	0	200	15-35	W1	R1
Avalon	200	0-15	0	0	None	800	0-15	None	0	200	15-35	W1	R1
Oakleaf	200	0-15	0	0	None	700	0-15	None	0	200	0-15	None	0

9.2.2.1 Inhoek

The Inhoek soil form consists of a Melanic A-horizon on top of an unspecified material. The soil family group identified for the Inhoek soil form on-site has been classified as the Oatlands (1100) soil family given the lack of hydromorphic properties and lime.

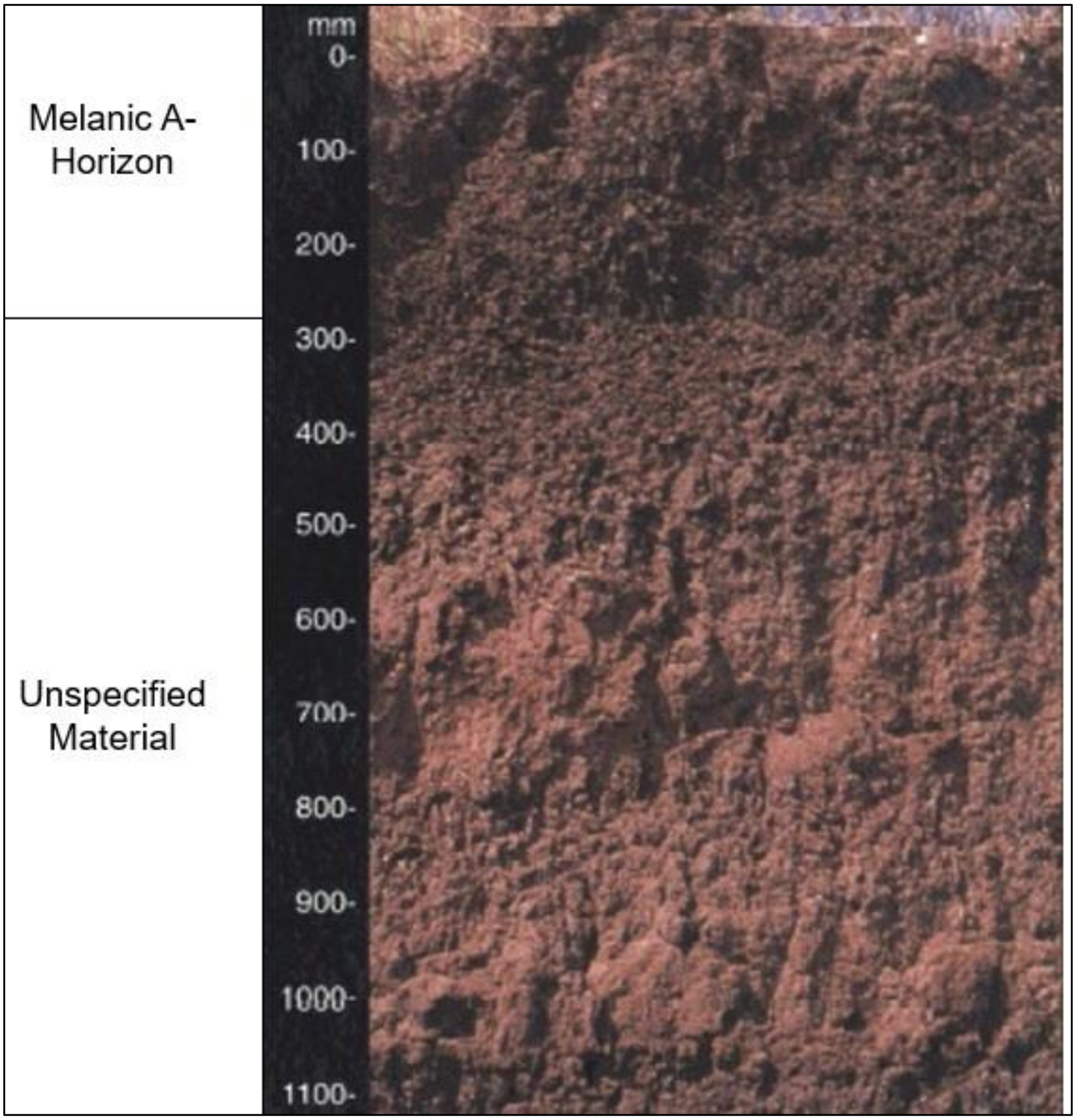

Figure 10: Example of an Inhoek soil form, (SASA, 1999).

9.2.2.2 Dresden

The Dresden soil form consists of an Orthic A-horizon on top of a Hard Plinthic B-horizon. The soil family group identified for the Dresden soil form on-site has been classified as the Hilldrop (2000) soil family given the fact that the A-horizon is leached.

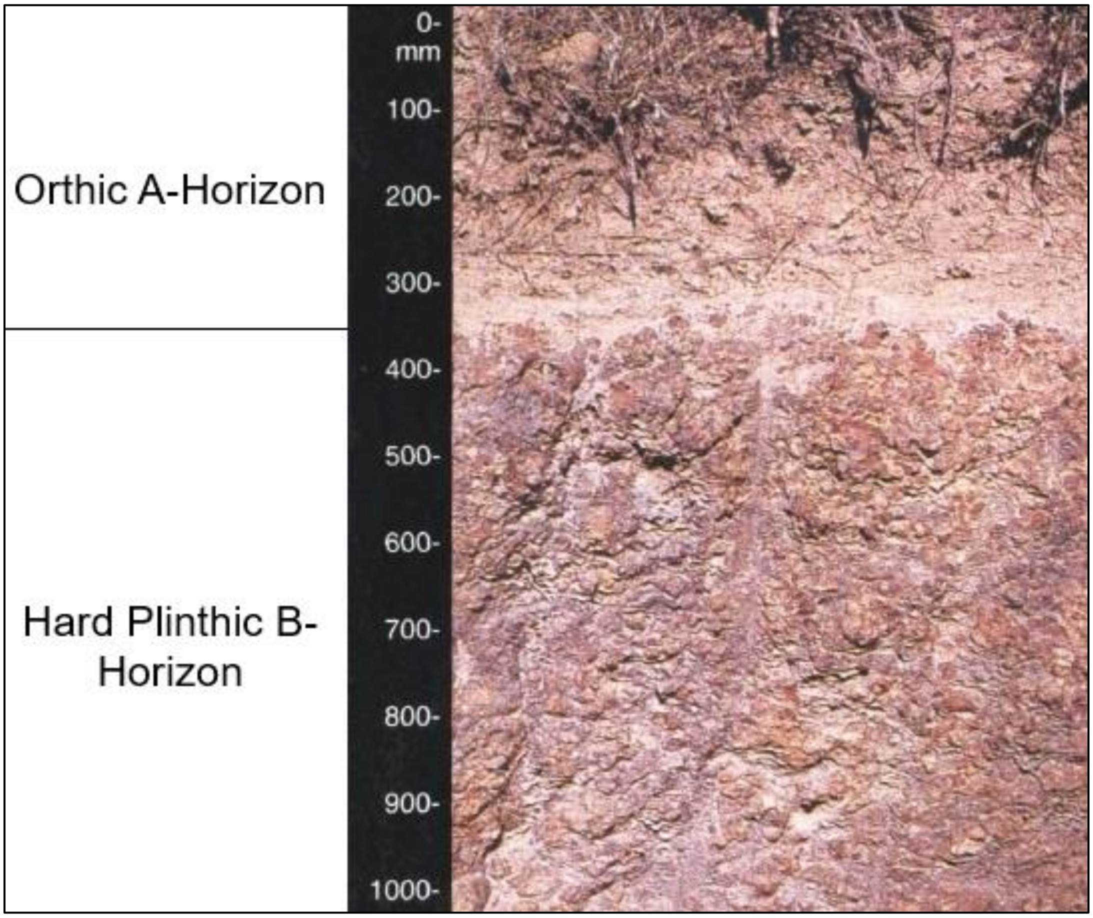

Figure 11: Example of a Dresden soil form, (SASA, 1999).

9.2.2.3 Westleigh

The Westleigh soil form consists of an Orthic A-horizon on top of a Soft Plinthic B-horizon. The soil family group identified for the Westleigh soil form on-site has been classified as the Helena (1000) soil family given the lack of evidence pertaining to luvic processes.

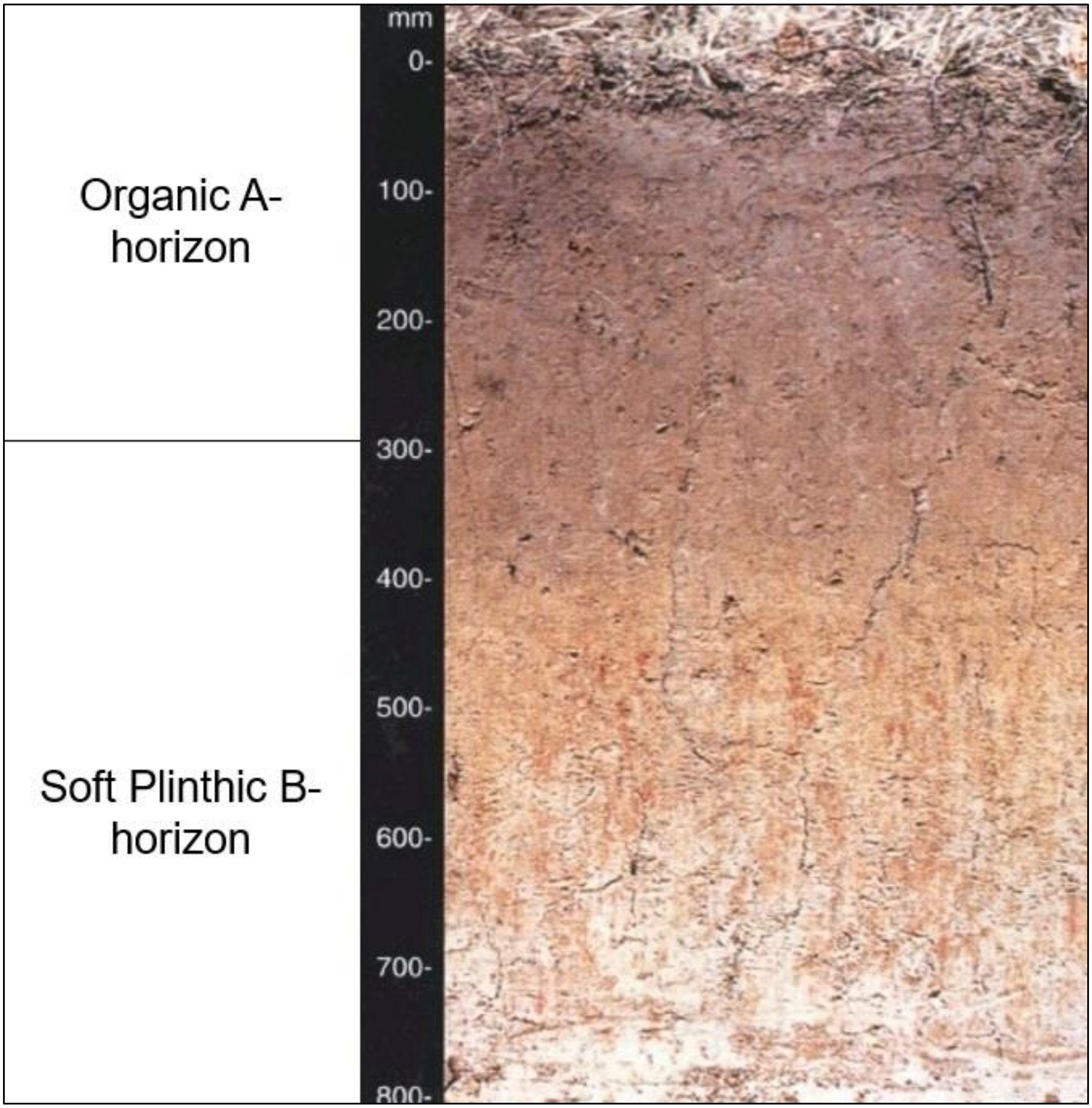

Figure 12: Example of a Westleigh soil form, (SASA, 1999).

9.2.2.4 Shortlands

The Shortlands soil form consists of an Orthic A-horizon on top of a Red Structured B-horizon. The soil family group identified for the Shortlands soil form on-site has been classified as the Groothoek (1120) soil family given the lack of lime, the dystrophic and mesotrophic nature of the soil and the presence of rough edges surrounding peds within the B-horizon.

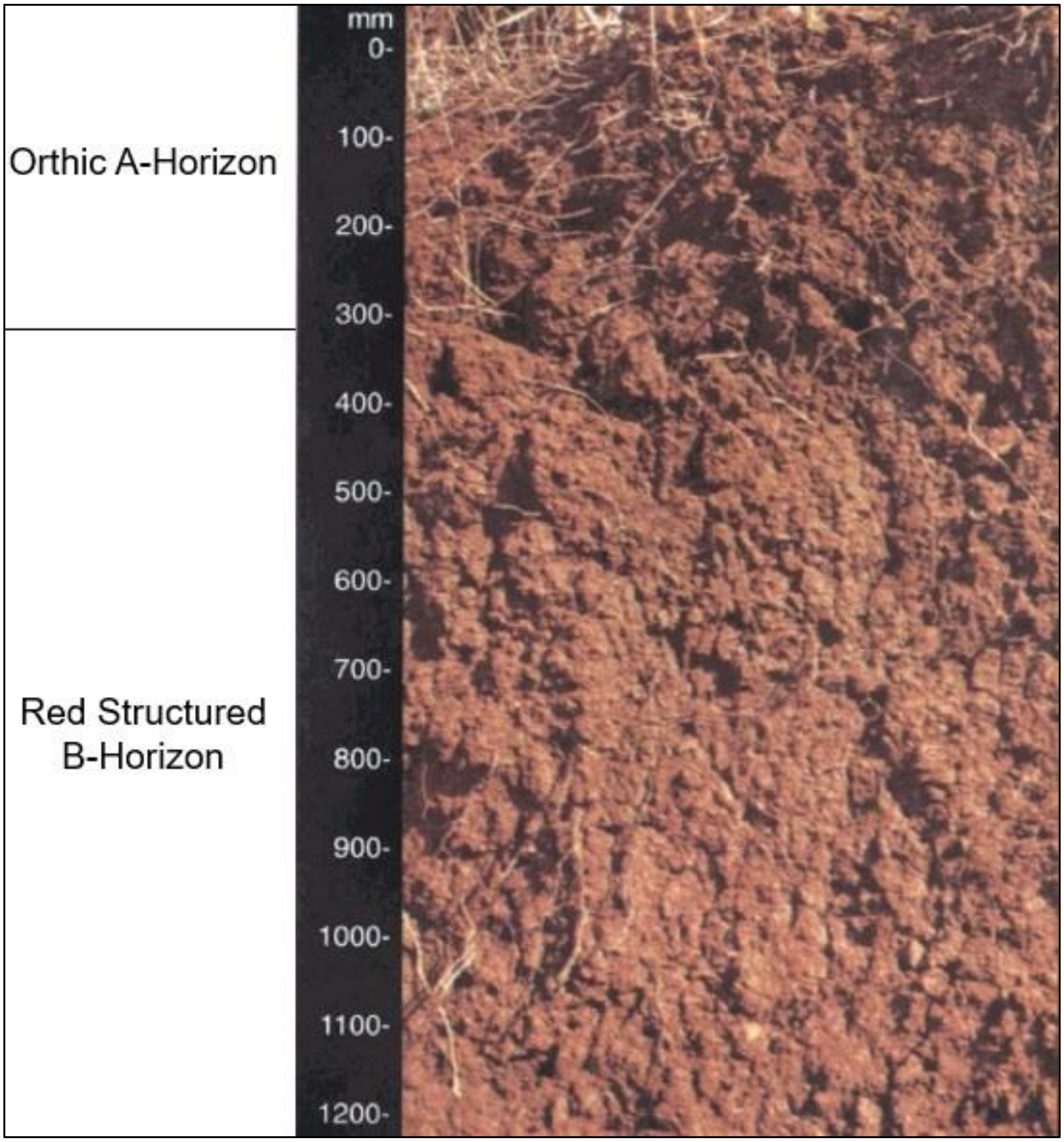

Figure 13: Example of a Shortlands soil form, (SASA, 1999).

9.2.2.5 Clovelly

The Clovelly soil form consists of an Orthic A-horizon on top of a Yellow-Brown B-horizon. The soil family group identified for the Clovelly soil form on-site has been classified as the Buckland (2100) soil family given the soil's non-luvic and mesotrophic nature.

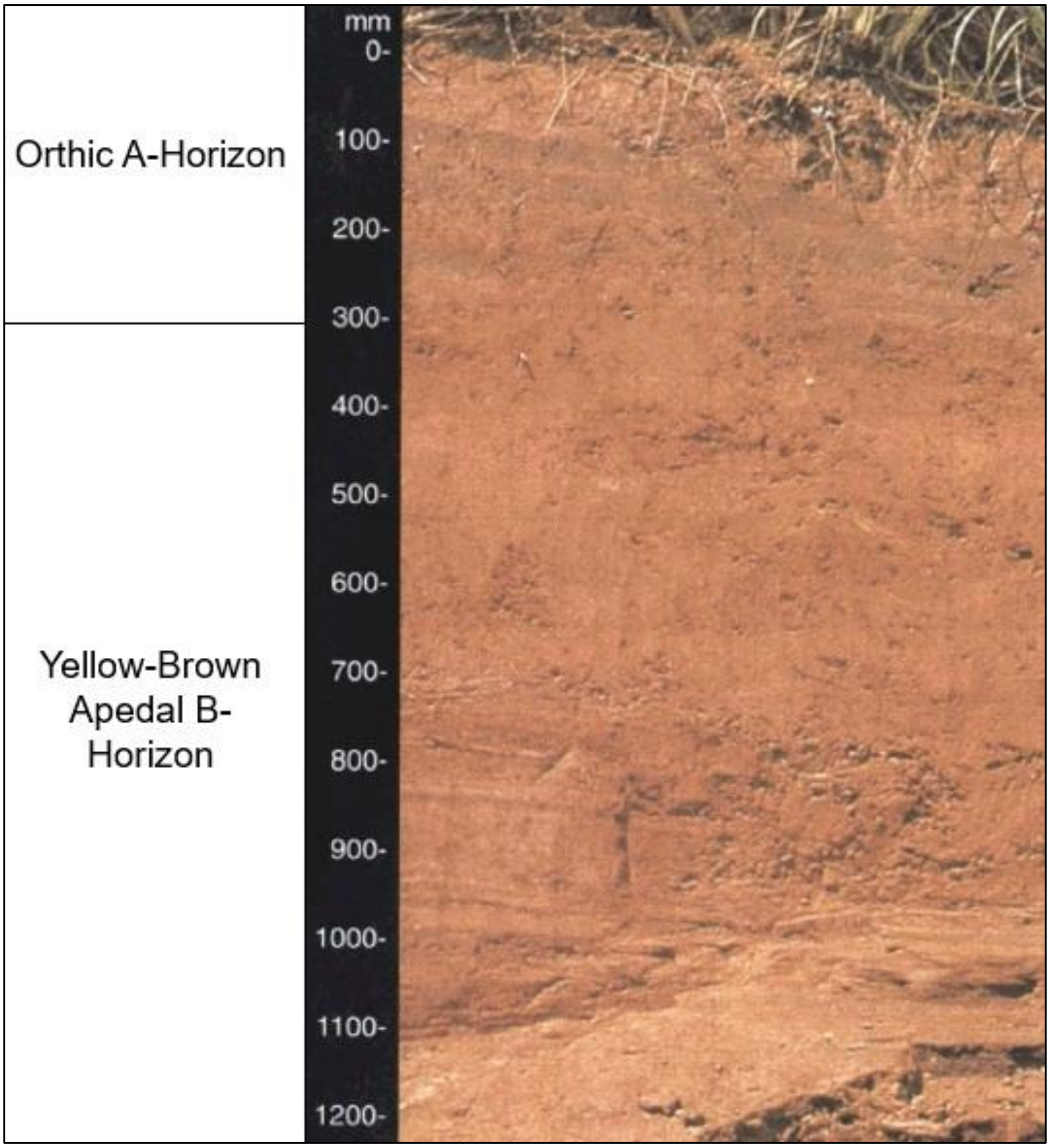

Figure 14: Example of a Clovelly soil form, (SASA, 1999).

9.2.2.6 Hutton

The Clovelly soil form consists of an Orthic A-horizon on top of a Red Apedal B-horizon. The soil family group identified for the Hutton soil form on-site has been classified as the Hayfield (2100) soil family given the soil's non-luvic and mesotrophic nature.

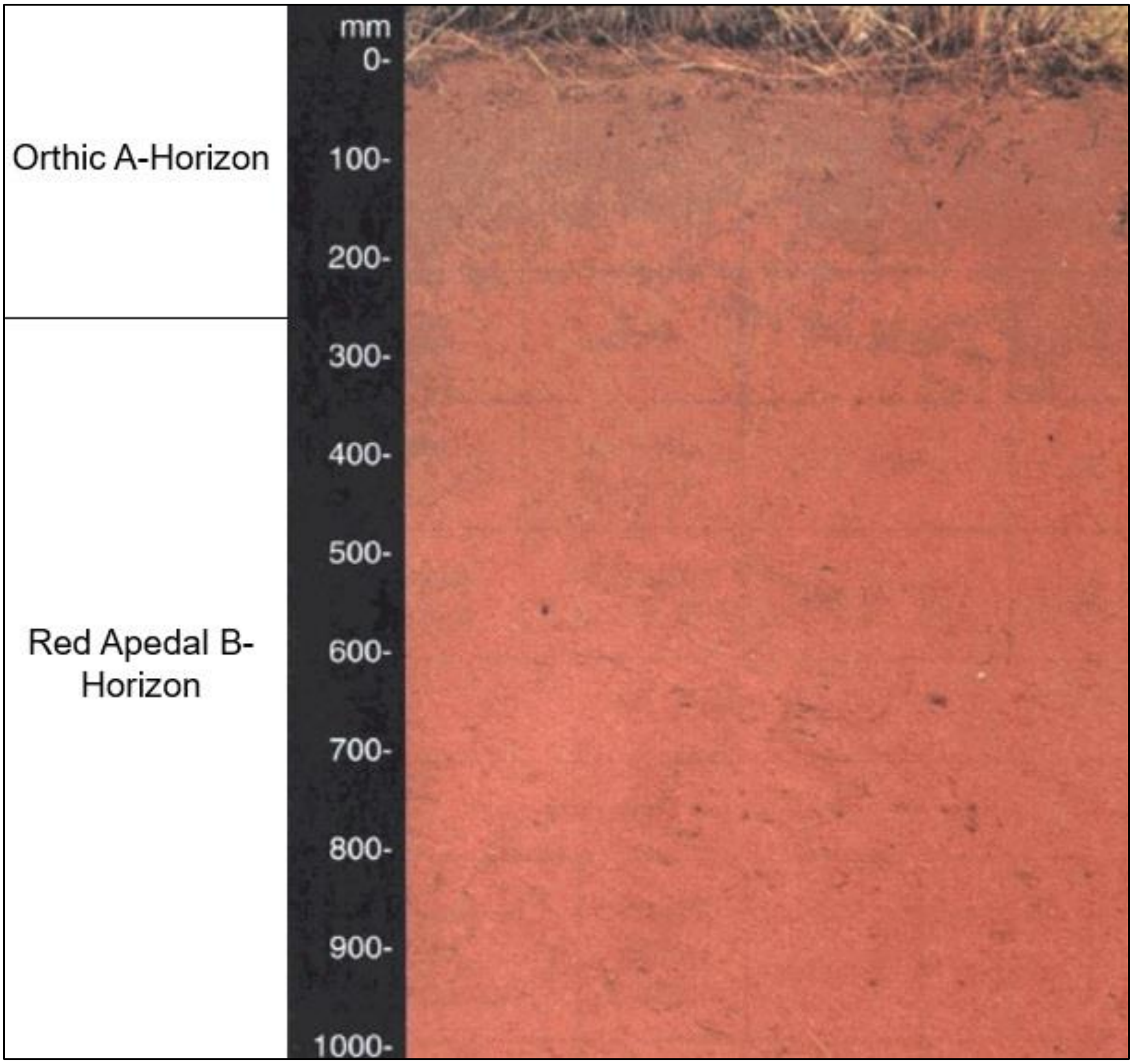

Figure 15: Example of a Hutton soil form, (SASA, 1999).

9.2.2.7 Longlands

The Longlands soil form consists of an Orthic A-horizon on top of a n E-horizon, which in turn is underlain by a Soft Plinthic B-horizon. The soil family group identified for the Longlands soil form on-site has been classified as the Sherbrook (1000) soil family due to the grey colour of the soil in wet conditions.

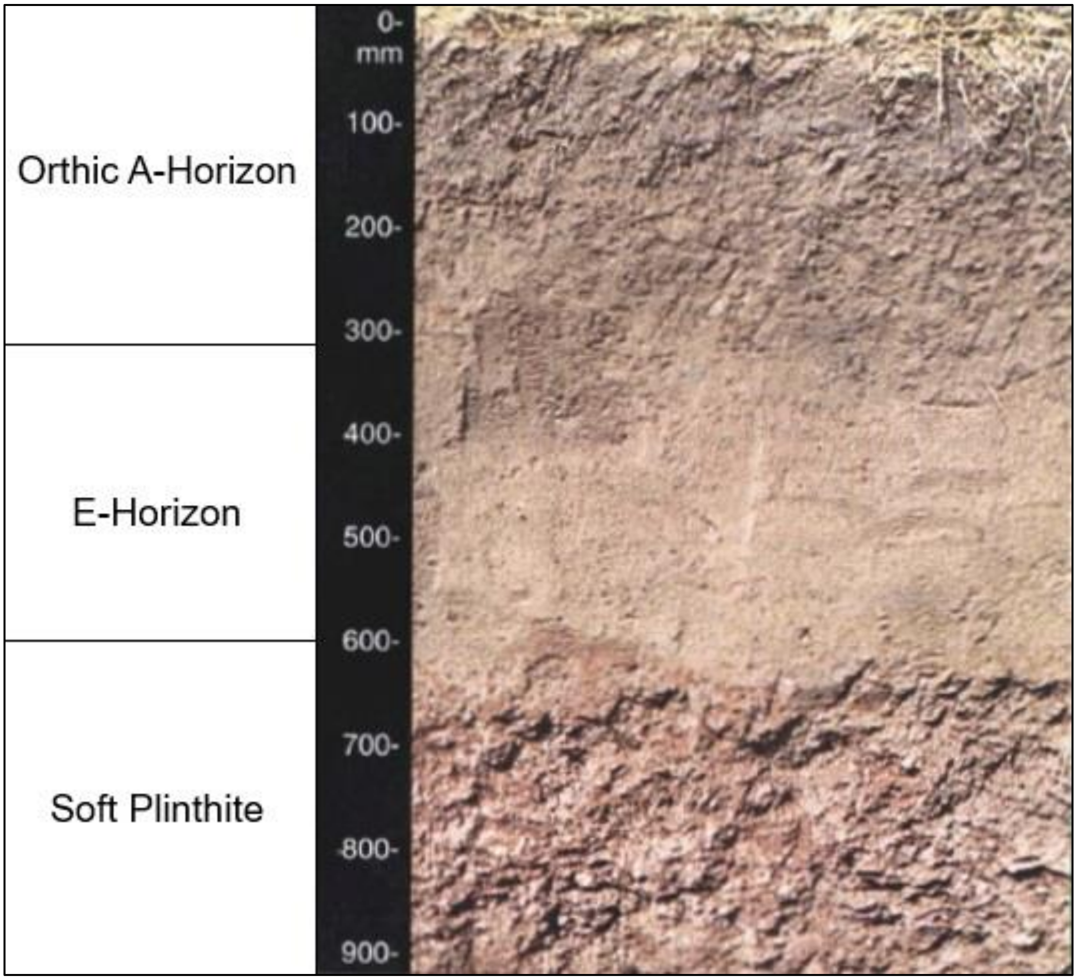

Figure 16: Example of a Longlands soil form, (SASA, 1999).

9.2.2.8 Tukulu

The Tukulu soil form consists of an Orthic A-horizon on top of a Neocutanic B-horizon, which in turn is underlain by an unspecified material with signs of wetness. The soil family group identified for the Tukulu soil form on-site has been classified as the Hoeko (1210) soil family due to the red colour of the soil and the non-luvic processes involved in this soil form.

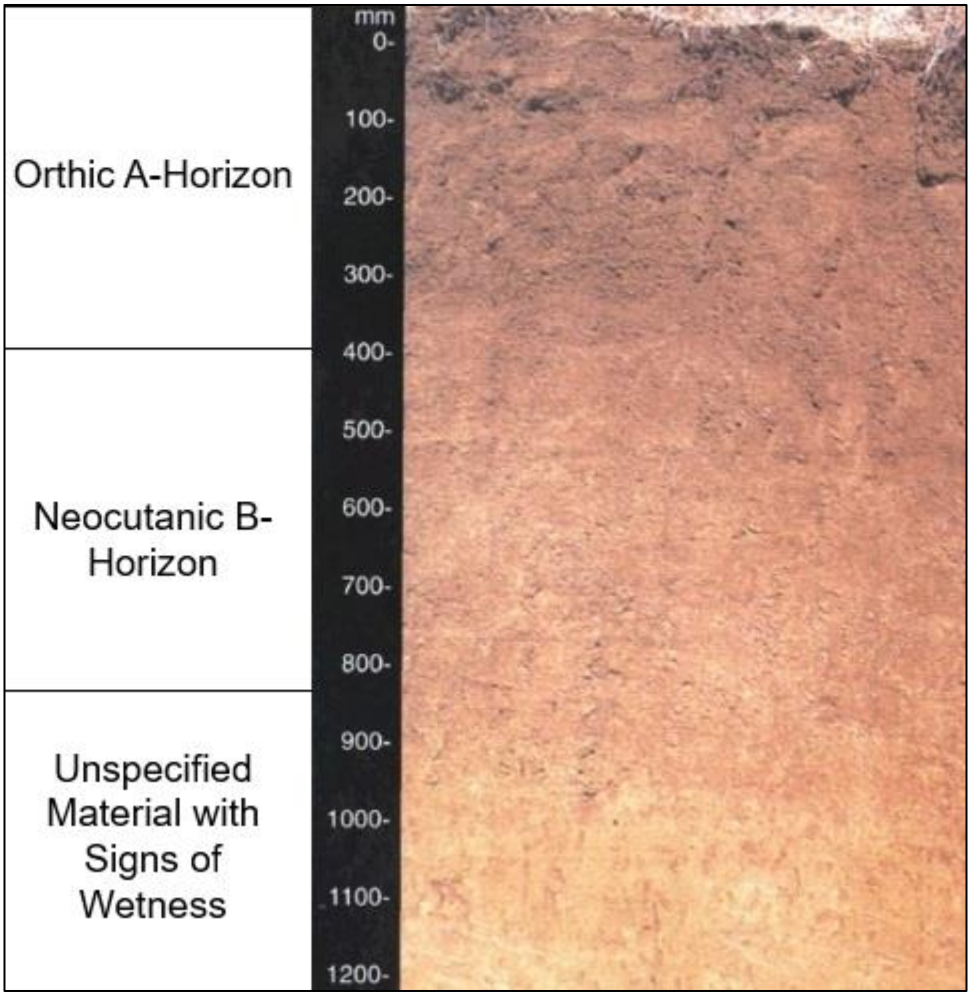

Figure 17: Example of a Tukulu soil form, (SASA, 1999).

9.2.2.9 Oakleaf

The Oakleaf soil form consists of an Orthic A-horizon on top of a Neocutanic B-horizon, which in turn is underlain by an unspecified material without signs of wetness. The soil family group identified for the Tukulu soil form on-site has been classified as the Caledon (1210) soil family due to the red colour of the soil and the non-luvic processes involved in this soil form.

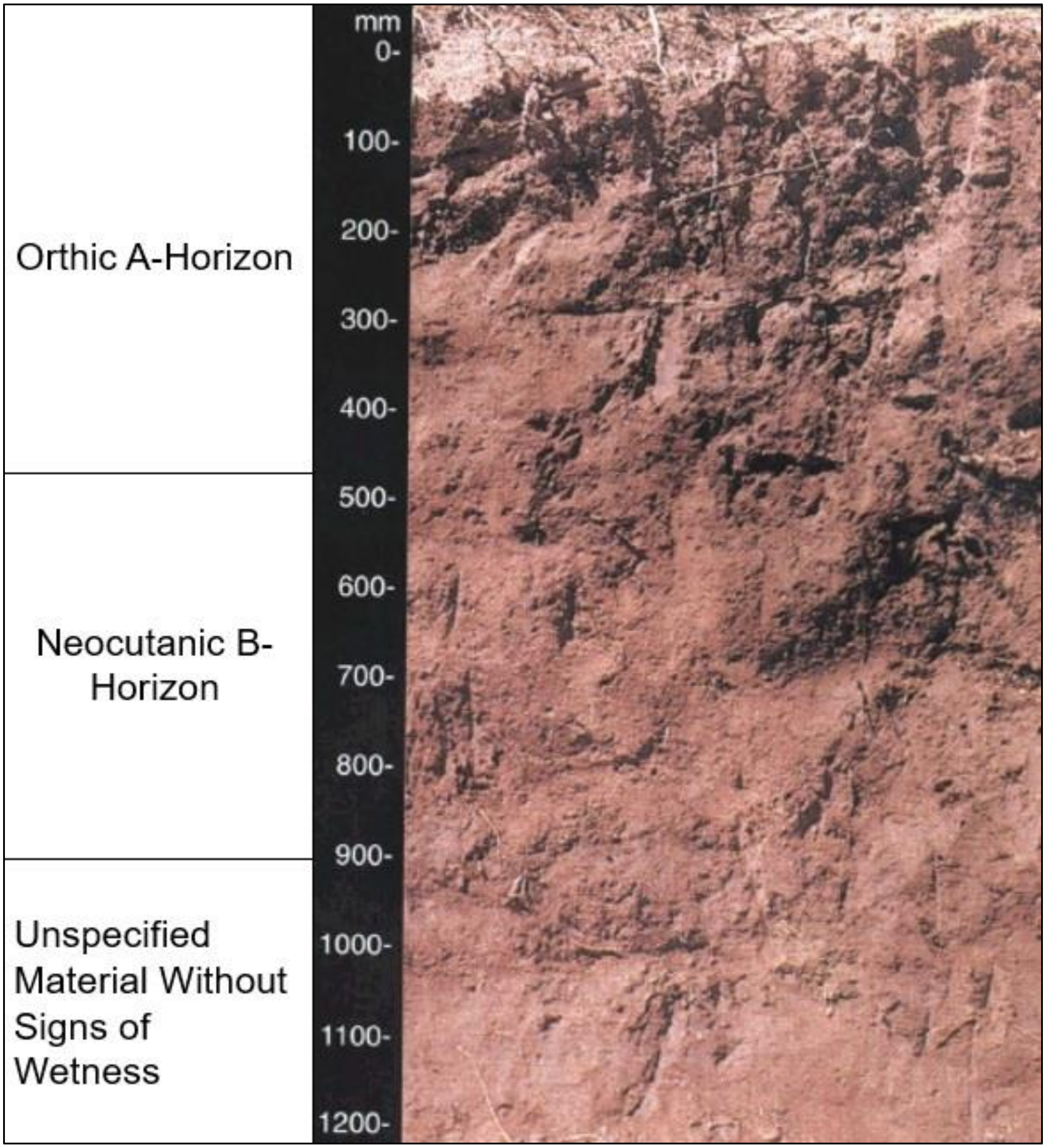

Figure 18: Example of an Oakleaf soil form, (SASA, 1999).

9.2.2.10 Fernwood

The Fernwood soil form consists of an Orthic A-horizon on top of an E-horizon, which in turn is underlain by an unspecified material. The soil family group identified for the Fernwood soil form on-site has been classified as the Penicuik (1110) soil family due to the light colour of the top soil and the grey colour of the E-horizon.

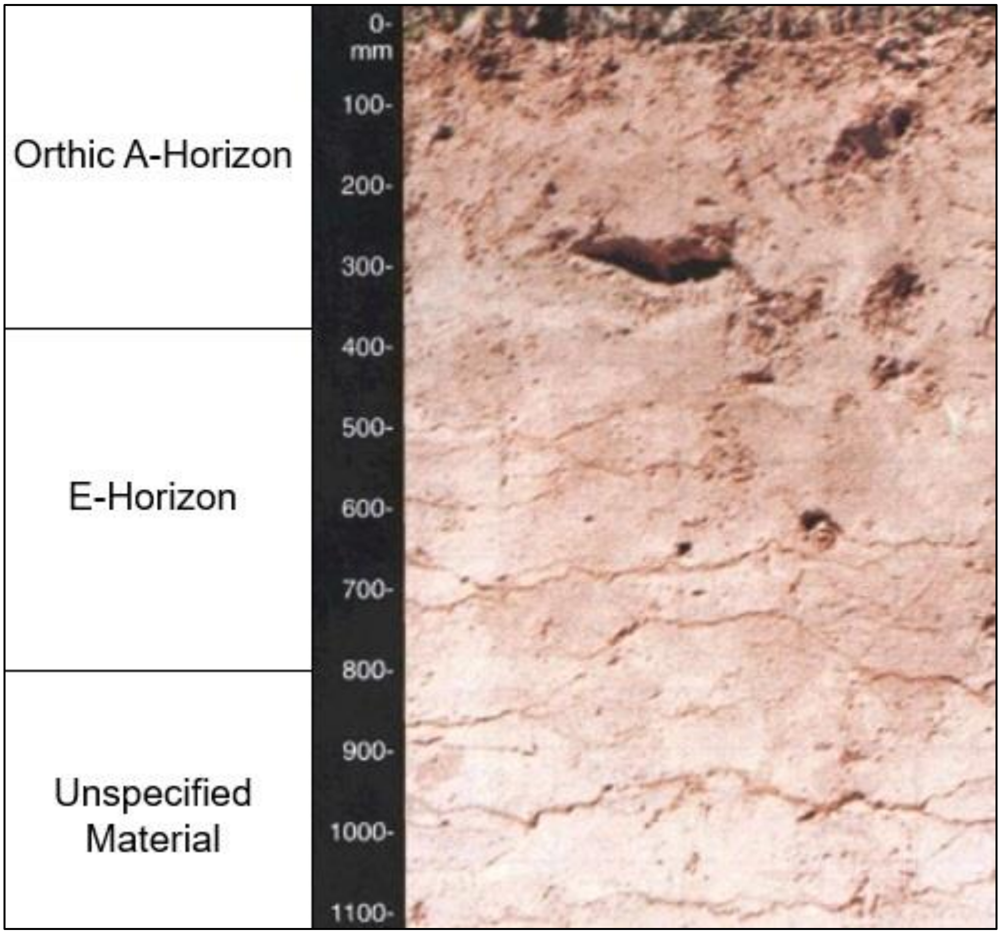

Figure 19: Example of a Fernwood soil form, (SASA, 1999).

9.2.2.11 Bainsvlei

The Bainsvlei soil form consists of an Orthic A-horizon on top of a Red Apedal B-horizon, which in turn is underlain by a Soft Plinthic B-horizon. The soil family group identified for the Bainsvlei soil form on-site has been classified as the Brandkraal (2100) soil family due to the non-luvic and mesotrophic nature of the soil form.

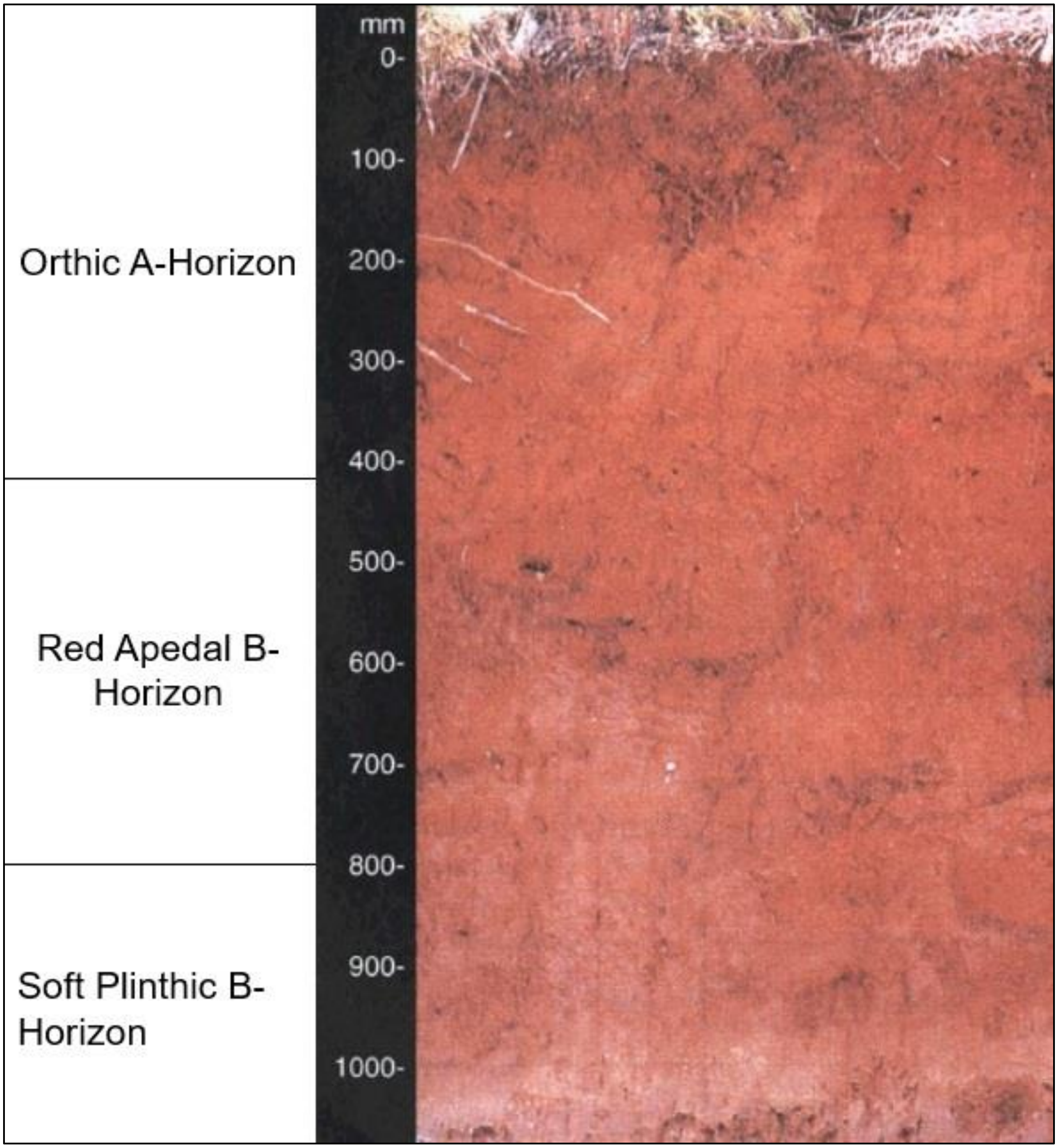

Figure 20: Example of a Bainsvlei soil form, (SASA, 1999).

9.2.2.12 Avalon

The Avalon soil form consists of an Orthic A-horizon on top of a Yellow-Brown Apedal B-horizon, which in turn is underlain by a Soft Plinthic B-horizon. The soil family group identified for the Avalon soil form on-site has been classified as the Avondale (2100) soil family due to the non-luvic and mesotrophic nature of the soil form.

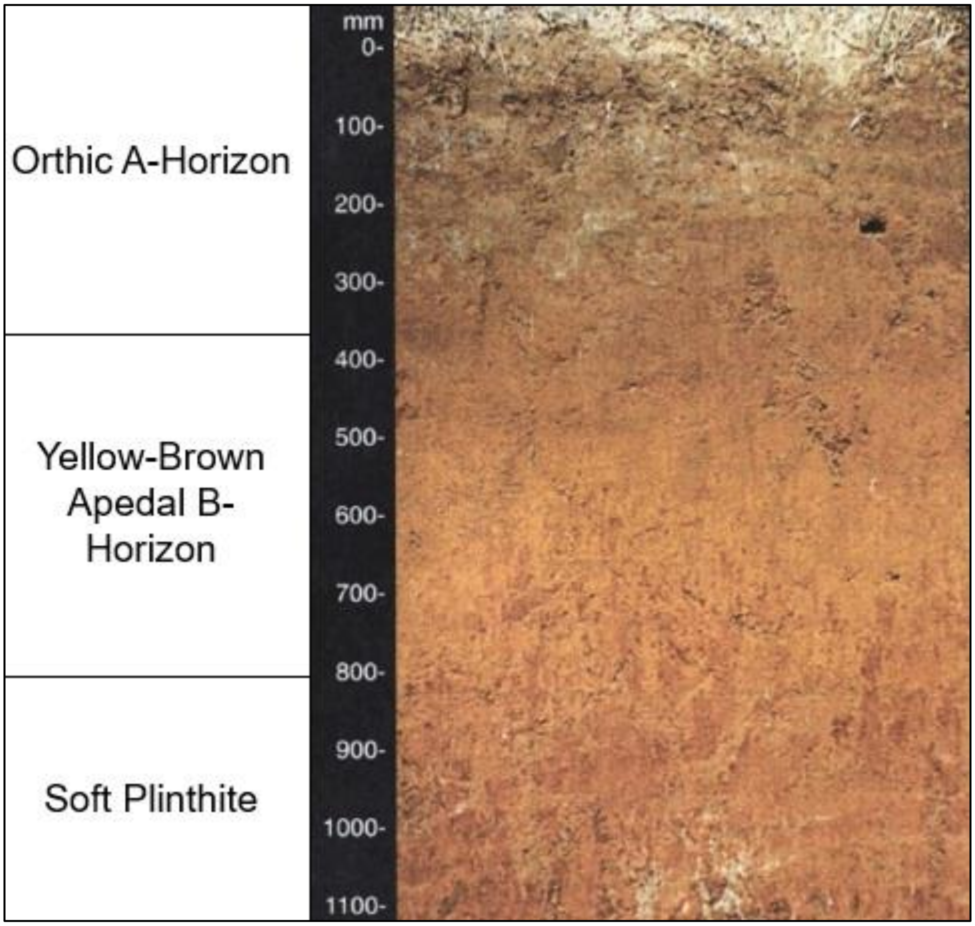

Figure 21: Example of an Avalon soil form, (SASA, 1999).

9.2.2.13 Mispah

The Mispah soil form consists of an Orthic A-horizon on top of a Hard Rock layer. The soil family group identified for the Mispah soil form on-site has been classified as the Myhill (1100) soil family due to the absence of lime and leached horizons.

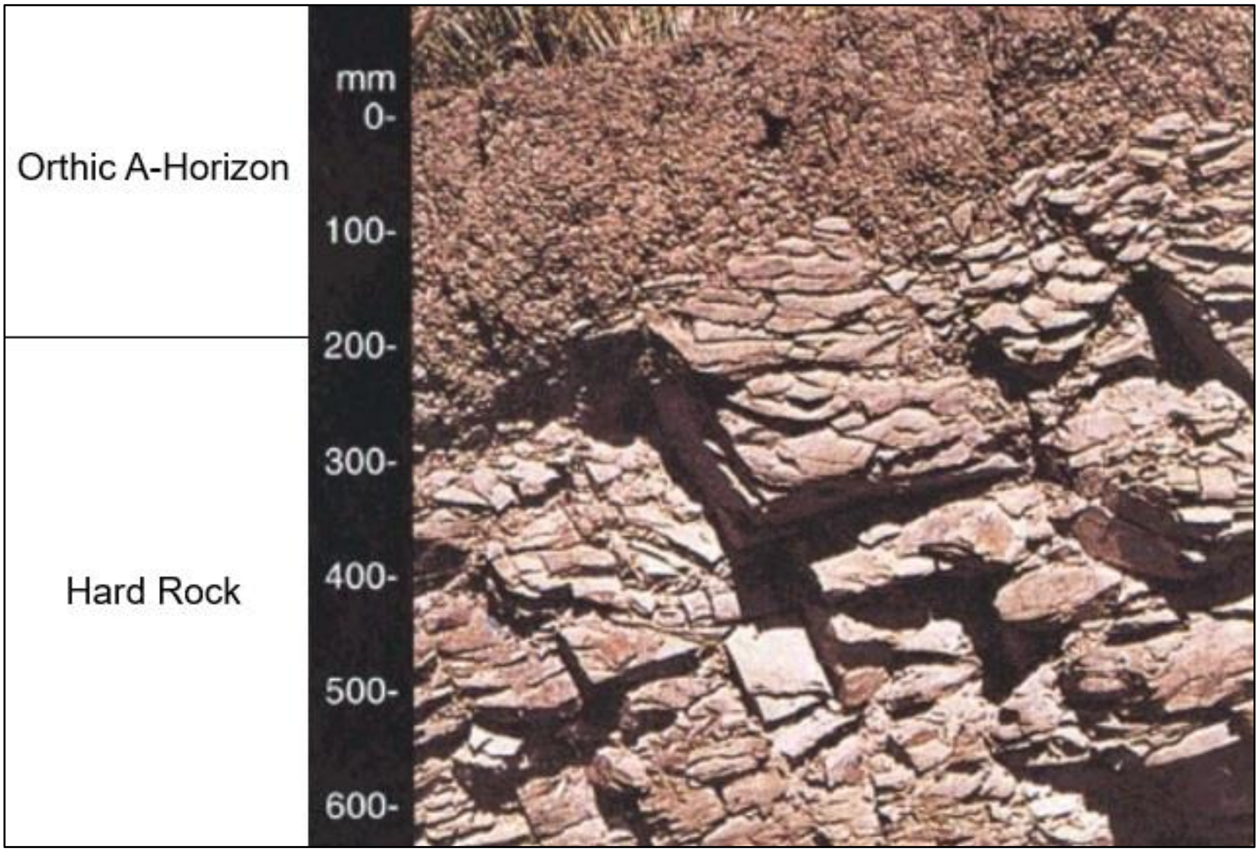

Figure 22: Example of a Mispah soil form, (SASA, 1999).

9.2.3 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.

9.2.3.1 Climate Capability

The climate capability for this region was determined to be C5 classification. The C5 climate capability class has a moderate to severe rating. This climate capability class is characterised by a moderately restricting growing season due to low temperatures, frost and/or moisture stress. Suitable crops are at risk of some yield loss, (Smith B. , 2006).

9.2.3.2 Land Capability

The land capability was determined by using the guidelines described in "The farming handbook" (Smith B. , 2006). A breakdown of the land capability classes is shown in Table 1. The land capability for the project area is illustrated in Figure 23 and described in Table 5. It is worth noting that the land capability of Shortlands "B" has been decreased from a Class II to a Class IV due to 20 to 30% rock and that the hydromorphic soils have been degraded to a Class V due to wetlands indicators within 200 mm from the surface.

Table 5: Land capability for the soils within the project area

Soil Forms	Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Percentage Within Project Area	Land Capability Group
Inhoek	Class II	Slight limitations, high arable potential and low erosion hazard	Adequate run-off control	Annual cropping with special tillage or ley (25%)	2%	Arable Land
Shortlands "A"	Class III	Moderate limitations with some erosion hazard	Special conservation practice and tillage methods	Rotation of crops and ley (50%)	45%	
Longlands	Class III					
Clovelly	Class III					
Hutton	Class III					
Tukulu	Class III					
Fernwood	Class III					
Bainsvlei	Class III					
Avalon	Class III					
Oakleaf	Class III					

Dresden	Class IV	Severe limitations, low arable potential and high erosion hazard	Intensive conservation practice	Long-term leys (75%)	35%	
Mispah	Class IV					
Westleigh	Class IV					
Shortlands "B"	Class IV					
Hydromorphic Soils	Class V	Water course and land with wetness limitations	Protection and control of water table	Improve pasture and afforestation	18%	Grazing

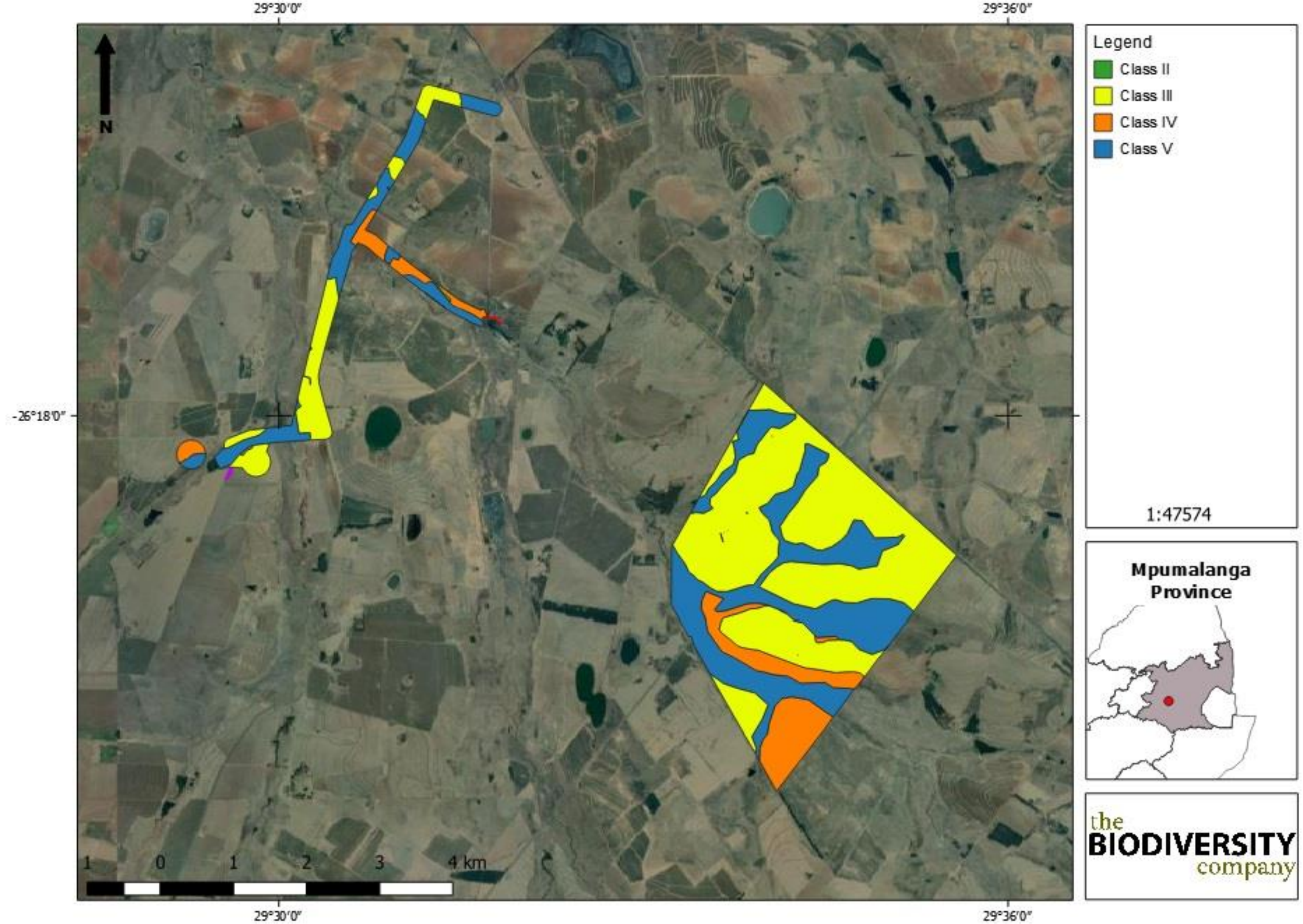

Figure 23: Soil classes for the project area

9.2.3.3 Land Potential

The land potential of the project area is illustrated in Figure 24 and described in Table 6. Classes II and III have been merged into a land potential of "L3" whereas class IV has been determined to have a land potential of "L4". Lastly, the wetland areas classified as class V have been classified as having a land potential of "Vlei".

Table 6: Land potential for the soils within the project area

Soil Forms	Land Capability Class	Land Potential	Percentage	Description of Land Potential Class
Inhoek	**Class II**	**L3**	**47%**	**Good potential: Infrequent and/or moderate limitations due to soil, slope, temperature or rainfall. Appropriate contour protection must be implemented and inspected.**
Shortlands "A"	**Class III**			
Clovelly	**Class III**			
Hutton	**Class III**			
Tukulu	**Class III**			
Fernwood	**Class III**			
Bainsvlei	**Class III**			
Avalon	**Class III**			
Oakleaf	**Class III**			
Dresden	**Class IV**	**L4**	**35%**	**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.**
Mispah	**Class IV**			
Westleigh	**Class IV**			
Shortlands "B"	**Class IV**			
Hydromorphic Soils	**Class V**	**Vlei**	**18%**	**N/A**

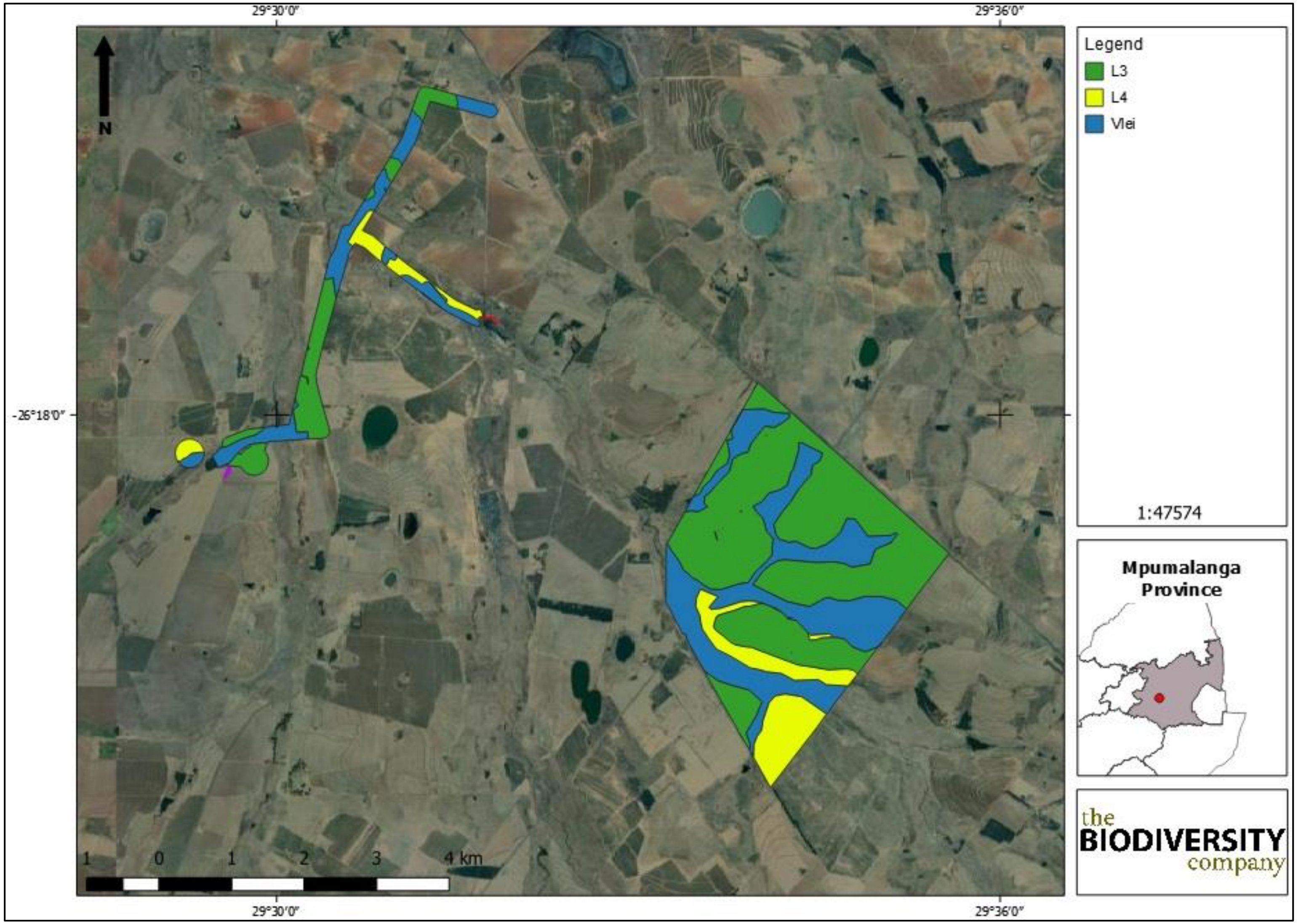

Figure 24: Land potential determined for the project area

9.2.4 Current Land Use

The project area is approximately 1500 ha in size with agriculture taking up approximately 50% of the space, wetlands taking up approximately 35%, natural veld taking up roughly 10% and built-up areas taking up approximately 5% of the project area, see Figure 25 to Figure 26.

Figure 25: Land use identified within the project area

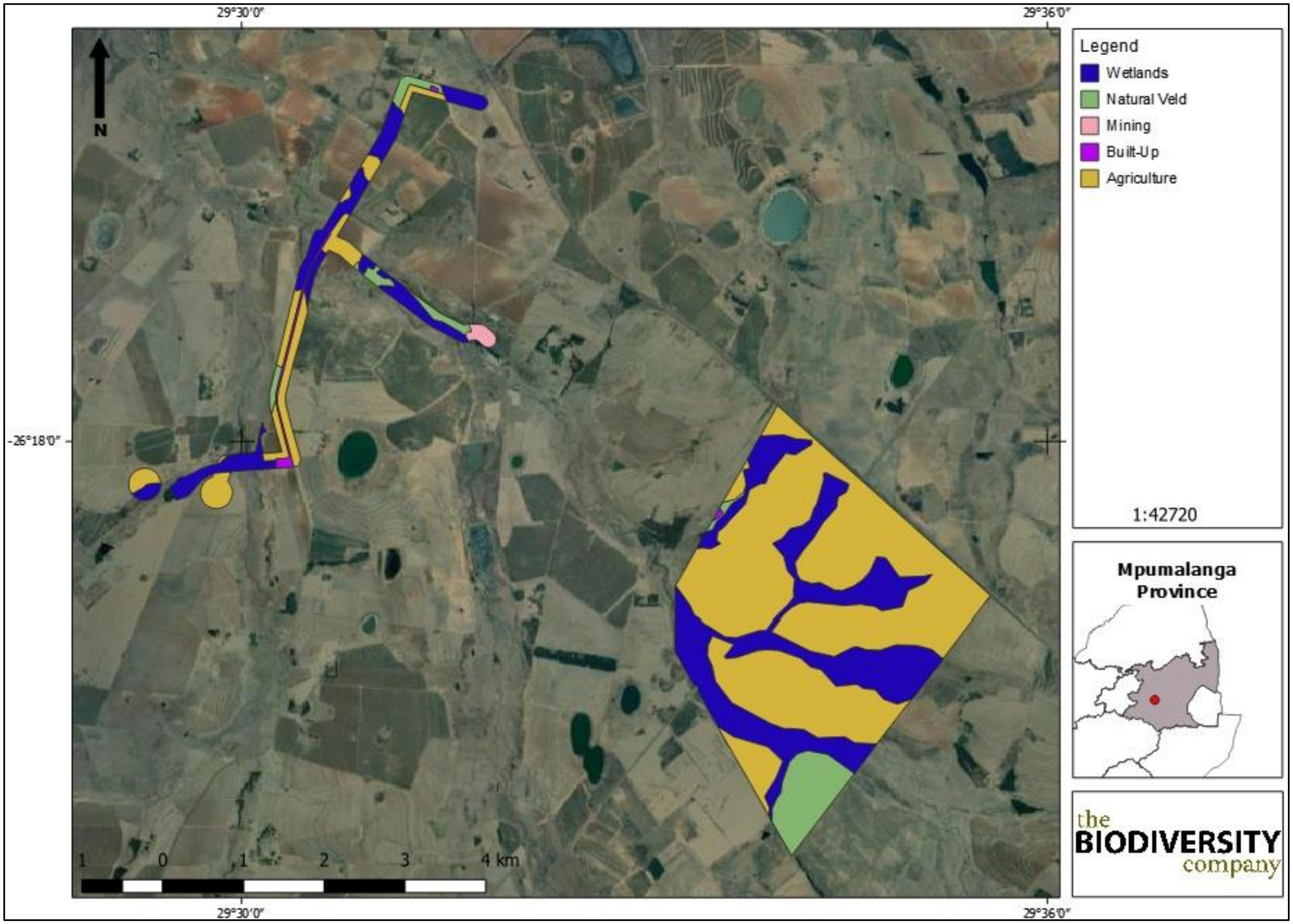

Figure 26: Land use for the project area

10. Impact Assessment

This section includes the impact assessment relevant to the proposed underground mining operations, the two alternative shaft areas, the access roads and the power line.

10.1 Methodology

The impact assessment methodology was provided by EIMS and is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (pre-and post-mitigation) by considering the consequence of each impact (nature of impact, extent, duration, magnitude, reversibility and probability). This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor which is applied to the environmental risk to determine the overall significance.

10.2 Current Impacts

The current impacts observed during surveys are listed below (see Figure 27).

- Dirt roads;
- Mining operations (shafts, conveyor belts etc.);
- Agriculture;
- Overgrazing; and
- Erosion.

Figure 27: Current Impacts

10.3 Anticipated Impact Framework

An impact framework was considered for the impact assessment. The following list provides a framework for the identified major impacts associated with the project.

1. Loss / degradation of soil resources
    a. Project activities that can result in the degradation of soil resources:
        i. Physical removal of vegetation
        ii. Access roads and servitudes
        iii. Construction camps & laydown areas
        iv. Development of shafts
        v. Soil dust precipitation
        vi. Coal dust precipitation
        vii. Stochastic events such as fire (cooking fires or cigarettes from staff)
        viii. Installation of poles for the proposed power line
    b. Secondary impacts anticipated
        i. Degradation of soils
        ii. Loss of land capability and land potential
        iii. Altering hydromorphic soils
        iv. Increased erosion

11. Impact Assessment Results

The comprehensive qualitative impact assessment results with mitigation measures is illustrated in "Appendix A- Impact Assessment Results". The planning, construction, operational, decommissioning and rehabilitation phases have been assessed for all four alternatives (the preferred and alternative ventilation shaft, the power lines, access roads and the underground mining operations). It is important to note that both powerline alternatives have been included in the same impact assessment given the fact that similar resources are located within the powerline's corridors and that the proposed activities are similar.

For the planning phase, "Low" (negative) impacts are expected before and after the application of mitigation measures given the fact that very little impacts are expected during this phase.

"High (negative)", "Moderate (negative)" and "Low (negative)" significance ratings are expected prior to mitigation for the construction phase of the proposed activities. For two of the four alternatives (referring to proposed activities). The significance rating is expected to decrease to "Low (negative)" after the application of the recommended mitigation measures. However, for the construction of both shafts (preferred and alternative), a decrease from "High (negative)" to "Moderate (negative)" is expected.

For the operational phase, only the two ventilation shaft alternatives are expected to have "Moderate (negative)" ratings, of which one is not expected to be decreased by implementing mitigation measures, namely that of the operations of the alternative shaft.

Three alternatives have been determined to have "Moderate (negative)" significance ratings during the decommissioning phase, of which two thereof cannot be decreased by means of the recommended mitigation measure, namely the decommissioning of the two shafts.

For the rehabilitation phase, two of the four alternatives have been determined to have "Moderate (negative)" significance ratings prior to mitigation, namely that of the rehabilitation of the two shaft areas. Mitigation in this case specifically refers to rehabilitation strategies. If rehabilitation is not successfully applied, degradation of soil might occur over long periods.

To summarise, five situations have been identified as having "Moderate (negative)" significance ratings (impacts) after the application of recommended mitigation measures. According to the mitigation hierarchy (Macfarlane et al., 2016), the next step is to rehabilitate degraded areas, which will be discussed in section 13- "Recommendations".

11.1 Planning Phase

The following potential impacts were considered on soil resources based on the planning related to the construction, operation, decommissioning and rehabilitation of the proposed power lines, access roads, ventilation shafts and the underground mining operations. This phase entails traversing areas affected by the proposed activities for logistic reasons. It has been assumed that this will be done by vehicle and on foot and is associated with very little impacts.

Table 7 to Table 10 illustrates the findings from the impact assessment relevant to the proposed activities for the planning phase.

Table 7: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**

Alternative	Preferred Shaft				
Phase	Ground Based Assessments for Planning Purposes				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	2	2	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	1	1
Environmental Risk (Pre-mitigation)					-1.25
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-1.67

Table 8: Significance ratings for the relevant phase and alternative

Impact Name	Degradation and/or loss of soil resources				
Alternative	Alternative Shaft and New Access Road				
Phase	Ground Based Assessments for Planning Purposes				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	2	2	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	1	1
Environmental Risk (Pre-mitigation)					-1.25
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1,33
Final Significance	-1.67

Table 9: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Power Lines and Access Road on Disturbed Area**				
Phase	**Ground Based Assessments for Planning Purposes**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	2	2	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	1	1
Environmental Risk (Pre-mitigation)					-1.25
Mitigation Measures					
See section 4- “Error! Not a valid result for table.**”**					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-1.25

Table 10: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Underground Mining Activities**				
Phase	**Ground Based Assessments for Planning Purposes**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	2	2	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	1	1
Environmental Risk (Pre-mitigation)					-1.25
Mitigation Measures					
See section 4- “Error! Not a valid result for table.**”**					

Environmental Risk (Post-mitigation)	-1.25
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1,00
Final Significance	-1.25

11.2 Construction Phase

The following potential impacts were considered on soil resources based on the construction phase of the proposed power lines, access roads, ventilation shafts and the underground mining operations. The only expected impact pertaining to soil resources is that of "Degradation and/or loss of soil resources".

Table 11 to Table 14 illustrate the findings from the impact assessment relevant to the proposed activities for the construction phase.

Table 11: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Preferred Shaft**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	4	3	Reversibility of Impact	4	3
Duration of Impact	4	3	Probability	5	4
Environmental Risk (Pre-mitigation)					-20,00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-12.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-16.00

Table 12: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Alternative Shaft and New Access Road**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	4
Extent of Impact	4	3	Reversibility of Impact	5	4
Duration of Impact	5	3	Probability	5	4
Environmental Risk (Pre-mitigation)					22.50
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-14.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-18.67

Table 13: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Power Lines and Access Road on Disturbed Area**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	4	3	Reversibility of Impact	3	3
Duration of Impact	2	4	Probability	4	3
Environmental Risk (Pre-mitigation)					-13,00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1,00
Final Significance	-9.75

Table 14: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Underground Mining Activities**				
Phase	**Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	3	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	3	3
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-9.75

11.3 Operational Phase

The following potential impacts were considered on soil resources based on the operational phase of the proposed power lines, the access roads, ventilation shafts and the underground mining operations. The only expected impact pertaining to soil resources is that of "Degradation and/or loss of soil resources".

Table 11 to Table 14 illustrate the findings from the impact assessment relevant to the proposed activities for the operational phase.

Table 15: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**
Alternative	**Preferred Shaft**
Phase	**Operation**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	2	Reversibility of Impact	3	2
Duration of Impact	4	4	Probability	4	3
Environmental Risk (Pre-mitigation)					-13,00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-10.00

Table 16: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Alternative Shaft and New Road**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	2	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	4	4
Environmental Risk (Pre-mitigation)					-14.00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-12.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-16.00

Table 17: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Power Lines and Access Road on Disturbed Area**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	2
Extent of Impact	1	1	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	2	2
Environmental Risk (Pre-mitigation)					-5.00
Mitigation Measures					
See section 4- “Error! Not a valid result for table.**”**					
Environmental Risk (Post-mitigation)					-5.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-5.00

Table 18: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Underground Mining Activities**				
Phase	**Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	3	3	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	3	3
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 4- “Error! Not a valid result for table.**”**					
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1,00
Final Significance	-9.75

11.4 Decommissioning

The following potential impacts were considered on soil resources based on the decommissioning phase of the proposed power lines, access roads, ventilation shafts and the underground mining operations. The only expected impact pertaining to soil resources is that of "Degradation and/or loss of soil resources".

Table 19 to Table 22 illustrates the findings from the impact assessment relevant to the proposed activities for the decommissioning phase.

Table 19: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Preferred Shaft**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	3	3	Reversibility of Impact	3	3
Duration of Impact	2	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-11,00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-10.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-13.33

Table 20: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**
Alternative	**Alternative Shaft and New Access Road**
Phase	**Decommissioning**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	3	Reversibility of Impact	3	3
Duration of Impact	2	2	Probability	4	4
Environmental Risk (Pre-mitigation)					-12.00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-11.00
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-14.67

Table 21: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Power Lines and Access Road on Disturbed Area**				
Phase	**Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	2	2	Reversibility of Impact	3	3
Duration of Impact	2	2	Probability	3	3
Environmental Risk (Pre-mitigation)					-7.50
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-7.50
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-7.50

Table 22: Significance ratings for the relevant phase and alternative

Impact Name	Degradation and/or loss of soil resources				
Alternative	Underground Mining Activities				
Phase	Decommissioning				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	3
Extent of Impact	3	3	Reversibility of Impact	3	3
Duration of Impact	4	4	Probability	3	3
Environmental Risk (Pre-mitigation)					-10.75
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-9.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-9.75

11.5 Rehabilitation

The following potential impacts were considered on soil resources based on the rehabilitation phase of the proposed power line, access roads, shafts and the underground mining operations once decommissioning has been completed. The only expected impact pertaining to soil resources is that of "Degradation and/or loss of soil resources".

Table 23 to Table 26 illustrates the findings from the impact assessment relevant to the proposed activities for the rehabilitation phase.

Table 23: Significance ratings for the relevant phase and alternative

Impact Name	Degradation and/or loss of soil resources				
Alternative	Preferred Shaft				
Phase	Rehabilitation				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	3	1
Extent of Impact	3	2	Reversibility of Impact	4	1
Duration of Impact	4	3	Probability	3	2
Environmental Risk (Pre-mitigation)					-10.50

Mitigation Measures	
See section 4- "Error! Not a valid result for table.**"**	
Environmental Risk (Post-mitigation)	-3.50
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Public Response	2
Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	2
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1,33
Final Significance	-4.67

Table 24: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Alternative Shaft and New Access Road**				
Phase	**Rehabilitation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	3	1
Extent of Impact	3	2	Reversibility of Impact	4	1
Duration of Impact	4	3	Probability	3	2
Environmental Risk (Pre-mitigation)					-10.50
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					2
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,33
Final Significance					-4.67

Table 25: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**
Alternative	**Power Lines and Access Road on Disturbed Area**
Phase	**Rehabilitation**
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	1	Magnitude of Impact	3	1
Extent of Impact	3	2	Reversibility of Impact	3	1
Duration of Impact	4	3	Probability	3	2
Environmental Risk (Pre-mitigation)					-9.75
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-3.50
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-3.50

Table 26: Significance ratings for the relevant phase and alternative

Impact Name	**Degradation and/or loss of soil resources**				
Alternative	**Underground Mining Activities**				
Phase	**Rehabilitation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	1	Magnitude of Impact	4	1
Extent of Impact	2	1	Reversibility of Impact	4	1
Duration of Impact	2	2	Probability	4	1
Environmental Risk (Pre-mitigation)					-12.00
Mitigation Measures					
See section 4- "Error! Not a valid result for table.**"**					
Environmental Risk (Post-mitigation)					-1.25
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1,00
Final Significance					-1.67

4 Sensitivity Mapping

4.1 Methodology

EIMS has developed a comprehensive sensitivity mapping methodology for use by all specialists in order to standardise the scoring system which allows for a comparative assessment of all impacts. The methodology utilises a revised scoring table as well as including a base score for the entire study area in question. This deviated from the past approach where features were scored based on their inherent sensitivity.

The updated methodology has shifted the focus from: (1) Scoring inherent environmental sensitivity towards' (2) Scoring the proposed project impact on landscape features. The new scoring methodology (Figure 28) shifted focus to identifying sensitive/non-sensitive areas in terms of the development activity, rather than the original method which focused purely on the sensitivity of the landscape/environment.

The new scoring methodology has made provision for specialists to score areas/features that would be suitable or preferred for development. It should be noted that features/areas should be scored in terms of the proposed project context and not purely on "perceived sensitivity of landscape features". Thus, the specialist should continually be asking themselves the question "how will this feature be affected by the proposed development". In cases where the development is anticipated to create a high negative impact, the high or very high scoring should be applied. High and very high scores must be justified. The final shape files must include a column indicating why each feature was assigned a certain score/sensitivity. In addition, a separate column must be provided indicating the numerical score in Figure 28.

To ensure that accurate site selection decisions will take place, the specialist must score sensitivity relative to the site in question. Ideally the specialist should only use very high sensitivity in rare cases, where such a score can be justified. Please note that legal licencing requirements or permit requirements should not be factored into the sensitivity score, this should be represented by a separate shape file indicating additional legal requirements.

Sensitivity Rating	Description	Weighting	Preference
Least Concern	The inherent feature status and sensitivity is already degraded. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1	Preferrable Negotiabl
Low/Poor	The proposed development will have not have a significant effect on the inherent feature status and sensitivity.	0	Restricted
High	The proposed development will negatively influence the current status of the feature.	+1	
Very High	The proposed development will negatively significantly influence the current status of the feature.	+2	

Figure 28: The sensitivity matrix utilised for the sensitivity mapping process (as provided by EIMS)

4.2 Agricultural Sensitivity

The sensitivity scores were rated on a scale as seen in Figure 28. The sensitivity scores for each habitat were then visually mapped (Figure 29).

Class “III”, “IV” and “V” has been determined to have a “low” sensitivity with the land capability class “II” being scored “medium”. It is however worth noting that a very small section of the “medium” sensitivity area is traversed by the proposed powerline alternative 1, which indicates very little impacts regardless of the sensitivity.

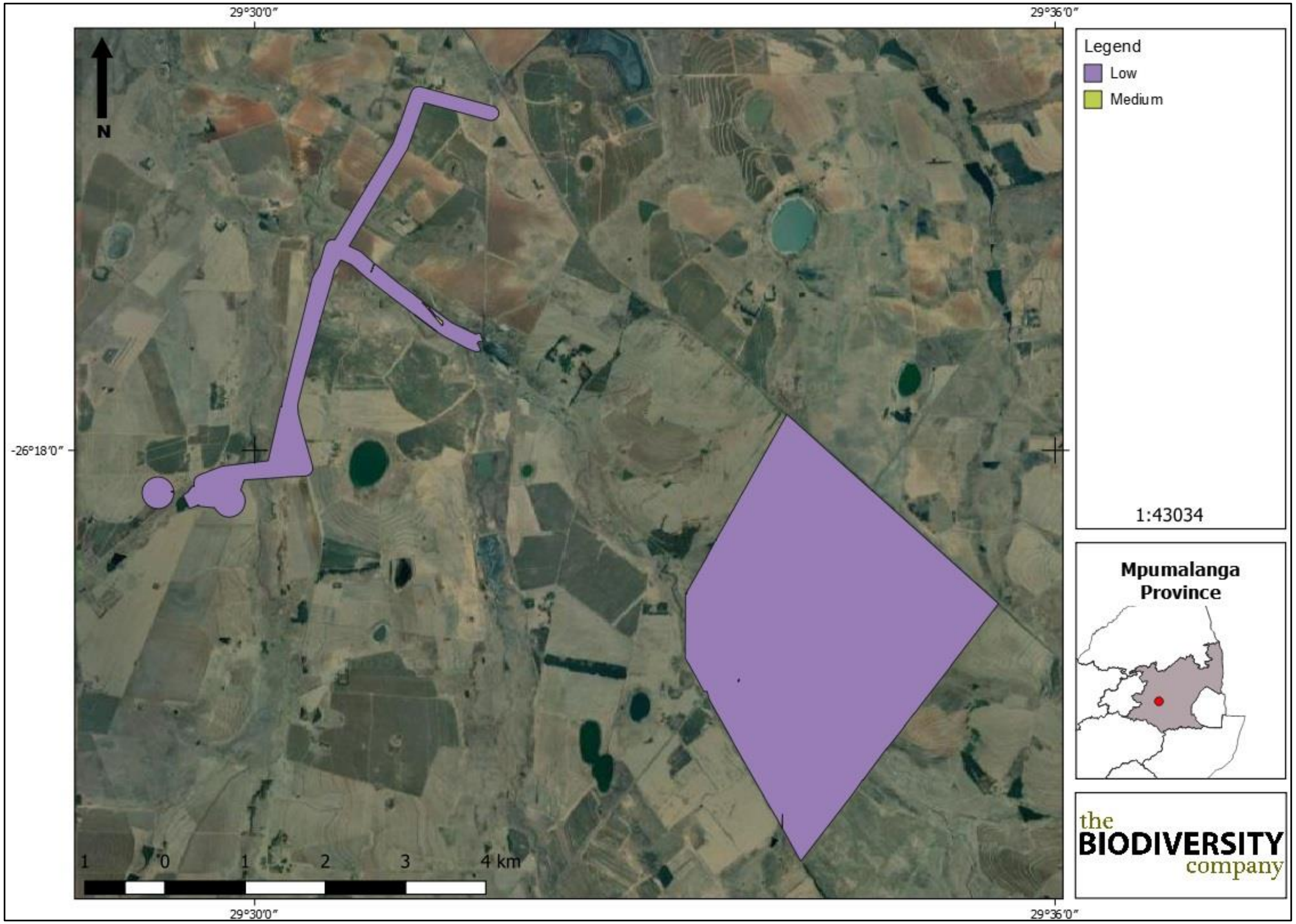

Figure 29: Agricultural sensitivity within the project area

12. Mitigation Measures

The mitigation actions provided below are important to consider in conjunction with other specialist assessments which include but are not limited to the following specialist studies: Groundwater, Surface Water and Wetlands. These mitigation measures should be implemented in the Environmental Management Plan (EMP) should the project go-ahead. The mitigation hierarchy proposed by Macfarlane *et al*., (2016) was considered for this study (Figure 30).

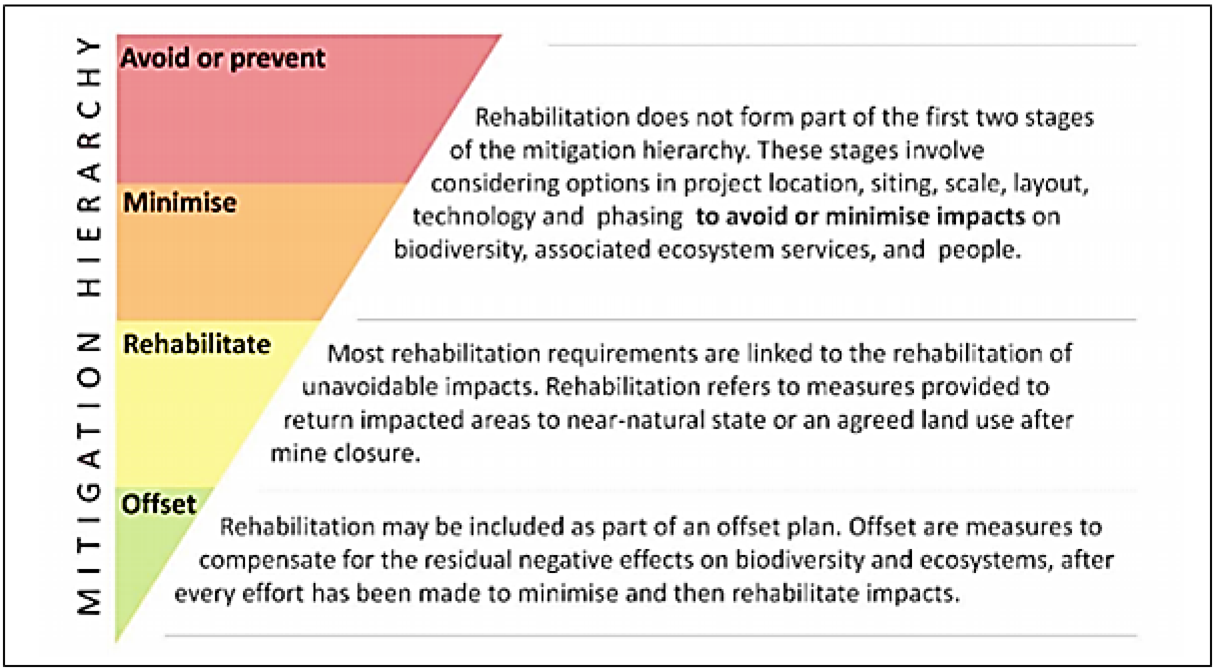

Figure 30: The Mitigation Hierarchy (Macfarlane *et al*., 2016)

As observed above, avoiding and preventing loss of sensitive landscapes are the first stage of the mitigation hierarchy. Considering this, the layout of the proposed infrastructure within the Kalabasfontein project area should, wherever possible, remain away from areas that are defined as sensitive as outlined in this report.

12.1 Mitigation Measures

Table 27 illustrates the mitigation measures applicable to various activities, phases with their respective time frames, responsibilities, targets etc.

Table 27: Mitigation measures including requirements for timeframes, roles and responsibilities

Activity	Mitigation Measures	Phase	Time Frame	Responsible party for implementation	Monitoring party (frequency)	Target	Performance indicator (Monitoring tool
Relevant planning	• Proper planning of mining sequences; • Stripping and stockpiling guidelines; and • rehabilitation and monitoring plans.	Planning	Prior to kick-off of construction	Applicant	Applicant	Ensure compliance with relevant legislation	No legal directives Legal compliance audit scores (Legal register) (ECO Monthly Checklist/Report)
Site clearance and topsoil removal prior to the commencement of physical construction activities.	• Ensure proper storm water management designs are in place; • If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure; • The topsoil should be stripped by means of an excavator bucket, and loaded onto a vehicle for transportation;	Construction Operation	Ongoing	Applicant Contractor ECO	Contractors EO (Daily) Mine EO (Weekly) ECO (Monthly)	Ensure compliance with relevant legislation	No legal directives Legal compliance audit scores (Legal register) (ECO Monthly Checklist/Report)

	• Stockpiles must be kept to a maximum height of 4m if space allows. Soil can be stockpiled to a height of 10m where it is absolutely necessary, keeping the 10m footprint as small as possible. • A soil fertility and post-mining land capability assessment must be done to address any compaction or fertility issues that may arise from the stockpiling (Post-rehabilitation). • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; • The subsoil approximately 0.3 – 0.8 m thick will then be stripped and stockpiled separately; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly; • Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles;						

	• Stockpiles should only be used for their designated final purposes; and • The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent alien weed growth and to reinstitute the ecological processes within the soil. • Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks; • If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; • Leaking vehicles will have drip trays place under them where the leak is occurring; and • If there are leaks the pipelines must be repaired immediately.						
• Operation and maintenance of the topsoil stockpiles. • Decommissioning; and • Rehabilitation of the Project area will be undertaken. includes the ripping of the compacted soil	• Ensure proper storm water management designs are in place; • If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and	Operation, Decommissioning and Rehabilitation.	Ongoing	Applicant Contractor ECO	Contractors EO (Daily) Mine EO (Weekly) ECO (Monthly)	Ensure compliance with relevant legislation	No legal directives Legal compliance audit scores (Legal register) (ECO Monthly Checklist/Report)

surfaces, spreading of topsoil and establishment of vegetation.	replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; • Implement land rehabilitation measures as defined in rehabilitation report. • Follow rehabilitation guidelines; • The topsoil should be moved by means of an excavator bucket, and loaded onto dump a relevant vehicle; • Topsoil is to be moved when the soil is dry, as to reduce compaction; • After the completion of the project the area is to be cleared of all infrastructure; • The foundations to be removed; • Topsoil to be replaced for rehabilitation purposes; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; and • Stockpiles should only be used for their designated final purposes. • Prevent any spills from occurring. Machines must be						

	parked within hardpark areas and must be checked daily for fluid leaks; • If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; • Leaking vehicles will have drip trays place under them where the leak is occurring; • Pipelines must be maintained; • Pipeline must be checked regularly for leaks; and • If there are leaks the pipelines must be repaired immediately.						
• Rehabilitation of the Project area will be undertaken. includes the ripping of the compacted soil surfaces, spreading of topsoil and establishment of vegetation. • Post-closure monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure	• The rehabilitated area must be assessed once a year for compaction, fertility, and erosion; • The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) as to correct any nutrient deficiencies; • Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; • If erosion occurs, corrective actions (erosion berms) must be taken to minimize any	Rehabilitation, Closure and monitoring	During monitoring	Applicant ECO Soil Specialist	ECO (Yearly) Soil Specialist (Yearly)	Ensure compliance with relevant legislation	No legal directives Legal compliance audit scores (Legal register) (ECO Monthly Checklist/Report)

that the mining area is restored to an adequate state. Monitoring will include soil fertility and erosion.	further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; and • Areas of subsidence must be reported and remediated as soon as possible with the best practises at the time of occurrence.						

13. Recommendations

A rehabilitation plan must be completed to tend to all expected impacts (discussed in this report) to minimise the impact on soil resources. This rehabilitation plan should focus on (but not limited to) the five situations expected to result in "Moderate (negative)" significance ratings after the application of mitigation measures. This should include revegetation of stockpiles and any other rehabilitation strategies.

Additionally, a soil stripping guideline must be set-up and a fertility assessment must be carried out on the chosen shaft area to determine the fertility of the relevant soil resources prior to construction. This information will be vital during the rehabilitation phase to ensure that the fertility and land capability be restored back to the soil's state prior to construction.

Lastly, the preferred shaft currently is located within a "Class III" land capability class with the alternative class being located within a "Class IV" and "Class V" land capability class. It is recommended that the shaft rather be constructed in the "Class IV" land capability class area in the vicinity of the alternative shaft. The shaft should be located north of the wetland buffer zone described in (TBC, 2018).

14. Conclusion

According to desktop studies, the project area is non-uniform with sudden increases in slope percentage up to 30%. Thirteen soil forms have been identified within the project area during the site visit. These soil forms, depending on clay percentage, depth, rock percentage ad surface crusting have been assigned land capability classes, of which four classes have been classified (class II, III, IV and V). These classes have then been assigned land potential classes given the climatic and land capability conditions, of which three have been identified (L2, L3 and "Vlei").

The project area is approximately 1500 ha in size with agriculture taking up approximately 50% of the space, wetlands taking up approximately 35%, natural veld taking up roughly 10% and built-up areas taking up approximately 5% of the project area.

15. Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development. Considering the above-mentioned conclusions, it is the opinion of the specialist that the Kalabasfontein project area, with the current proposed infrastructures layout areas, may be favourably considered.

The two ventilation shaft areas and the construction of the new road are of main concern in regard to the loss of land capability, given the fact that these two alternatives are associated with the five situations that have been determined to have "Moderate (negative)" significance ratings post-mitigation. However, according to the mitigation hierarchy, if avoiding or minimising impacts are not possible (as in the case of these five situations), rehabilitation will be required to ensure that soil resources are not lost or degraded.

In addition, it is the specialist's opinion that impacts to soil resources by means of underground mining activities and that the construction/operation of the proposed power lines and existing access roads are minimal, and that rehabilitation will be sufficient in ensuring that soil resources are not lost in the case of the two shaft areas.

The preferred shaft currently is located within a “Class III” land capability class with the alternative class being located within a “Class IV” and “Class V” land capability class. It is recommended that the shaft rather be constructed in the “Class IV” land capability class area in the vicinity of the alternative shaft. The shaft should be located north of the wetland buffer zone described in (TBC, 2018). It also is the specialist’s opinion that any of the proposed powerline alternatives be selected for construction given very little impacts from both of these options.

16. References

Camp, K. (1995). The Bioresource Units of KwaZulu-Natal. Pietermaritzburg: Department of Agriculture, Environmental Affairs & Rural Development.

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.

SASA, S. A. (1999). Identification & management of the SOILS of the South African sugar industry. Mount Edgecombe: South African Sugar Association Experiment Station.

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.

The Biodiversity Company. 2018. Wetland Assessment - Proposed Kalabasfontein Coal Mining Project Extension.

Appendix A- Impact Assessment Results

Table 28: Impact assessment results

IMPACT DESCRIPTION			PRE - MITIGATION							POST - MITIGATION								IMPACT PRIORITISATION				
Impact	Alternative	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Public response	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Loss of Land Capability	Preferred Shaft	Planning	-1	2	2	4	4	4	-12	-1	1	2	1	1	1	-1,25	High	2	1	2	1,33	-1,67
Loss of Land Capability	Preferred Shaft	Construction	-1	4	4	4	4	5	-20	-1	3	3	3	3	4	-12	High	2	1	2	1,33	-16,00
Loss of Land Capability	Preferred Shaft	Operation	-1	3	4	3	3	4	-13	-1	2	4	2	2	3	-7,5	High	2	1	2	1,33	-10,00
Loss of Land Capability	Preferred Shaft	Decommissioning	-1	3	2	3	3	4	-11	-1	3	2	2	3	4	-10	High	2	1	2	1,33	-13,33
Loss of Land Capability	Preferred Shaft	Rehab and closure	-1	3	4	3	4	3	-10,5	-1	2	3	1	1	2	-3,5	High	2	1	2	1,33	-4,67
Loss of Land Capability	Alternative Shaft and New Access Road	Planning	-1	2	2	4	4	4	-12	-1	1	2	1	1	1	-1,25	High	2	1	2	1,33	-1,67
Loss of Land Capability	Alternative Shaft and New Access Road	Construction	-1	4	5	4	5	5	-22,5	-1	3	3	4	4	4	-14	High	2	1	2	1,33	-18,67
Loss of Land Capability	Alternative Shaft and New Access Road	Operation	-1	3	4	4	3	4	-14	-1	2	4	3	3	4	-12	High	2	1	2	1,33	-16,00
Loss of Land Capability	Alternative Shaft and New Access Road	Decommissioning	-1	3	2	4	3	4	-12	-1	3	2	3	3	4	-11	High	2	1	2	1,33	-14,67
Loss of Land Capability	Alternative Shaft and New Access Road	Rehab and closure	-1	3	4	3	4	3	-10,5	-1	2	3	1	1	2	-3,5	High	2	1	2	1,33	-4,67
Loss of Land Capability	Power Lines and Access Road on Disturbed Area	Planning	-1	2	2	4	4	4	-12	-1	2	2	2	2	2	-4	Medium	1	1	1	1,00	-4,00
Loss of Land Capability	Power Lines and Access Road on Disturbed Area	Construction	-1	4	2	4	3	4	-13	-1	3	4	3	3	3	-9,75	High	1	1	1	1,00	-9,75
Loss of Land Capability	Power Lines and Access Road on Disturbed Area	Operation	-1	1	4	2	3	2	-5	-1	1	4	2	3	2	-5	High	1	1	1	1,00	-5,00
Loss of Land Capability	Power Lines and Access Road on Disturbed Area	Decommissioning	-1	2	2	3	3	3	-7,5	-1	2	2	3	3	3	-7,5	High	1	1	1	1,00	-7,50
Loss of Land Capability	Power Lines and Access Road on Disturbed Area	Rehab and closure	-1	3	4	3	3	3	-9,75	-1	2	3	1	1	2	-3,5	Medium	1	1	1	1,00	-3,50

Loss of Land Capability	Underground Mining	Planning	-1	3	3	3	3	3	-9	-1	2	2	2	2	2	-4	Medium	1	1	1	1,00	-4,00
Loss of Land Capability	Underground Mining	Construction	-1	3	4	3	3	3	-9,75	-1	3	4	3	3	3	-9,75	High	1	1	1	1,00	-9,75
Loss of Land Capability	Underground Mining	Operation	-1	3	4	3	3	3	-9,75	-1	3	4	3	3	3	-9,75	High	1	1	1	1,00	-9,75
Loss of Land Capability	Underground Mining	Decommissioning	-1	3	4	4	3	3	-10,5	-1	3	4	3	3	3	-9,75	High	1	1	1	1,00	-9,75
Loss of Land Capability	Underground Mining	Rehab and closure	-1	3	4	3	3	3	-9,75	-1	2	3	1	1	2	-3,5	Medium	1	1	1	1,00	-3,50