BASELINE SOILS, LAND CAPABILITY AND AGRICULTURAL POTENTIAL ASSESSMENT

FOR AN ENVIRONMENTAL IMPACT ASSESSMENT APPLICATION FOR THE ERGO MINING SOLAR PV FACILITY (PHASE 2), WITH A PLANT CAPACITY OF 40MW, WITHIN THE EKURHULENI LOCAL MUNICIPALITY, GAUTENG

Prepared for:

Environmental Management Assistance (Pty) Ltd
c/o Alicia Govender
Tel: 083 784 0460
Email: alicia@hunadigroup.co.za

Prepared by:

MALACHITE
ECOLOGICAL SERVICES

Tel: 078 0230532
Email: rowena@malachitesa.co.za

Final Version
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Declaration of Independence by Specialists

I, Rowena Harrison, hereby declare that I -

- Act as an independent soil consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Have and will not have vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- Based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability.

RHarrison

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Rowena Harrison

SACNASP Reg. No. 400715/15

Date: 10th February 2022

EXECUTIVE SUMMARY

Malachite Ecological Services was appointed by Environmental Management Assistance (Pty) Ltd to undertake a Baseline Soils, Land Capability and Agricultural Potential Assessment for the proposed construction of a Solar Photovoltaic (PV) plant (phase 2), with a capacity of 40MW to supply power to the existing Ergo Mining (Pty) Ltd Brakpan Plant. The proposed project is situated off the R23 (Heidelberg Road), within the Ekurhuleni Local Municipality, Gauteng.

The terms of reference for the study were as follows:

- A desktop investigation of the land type associated with the study site. Land Type data is classified according to the Binomial System of 1977. Soil data was extracted from the land type information and re-classified as per the Soil Classification Working Group (2018).
- Describe the geology, topography, watercourses, and climate of the site.
- Describe the agricultural potential of the site based on the information attained from the land type data, Phase 1 of the Ergo Gold PV project Soil, Land Capability and Agricultural Assessment (Malachite Ecological Services, 2021); as well as the slope; climatic data, and wetness.
- Recommend actions for the impact assessment phase of this study as well as measures to lessen any potential impacts on the soils within the study site from the proposed development.

A combination of Land Type data and the information gathered from phase 1[1] of the Ergo Gold PV project was utilised to determine the soils, land capability and agricultural potential of the study site. The Land Type data showed that the general area that the site is situated in consists of plinthic soils which indicate a fluctuating water table and is represented by soils of the Hutton, Bainsvlei, Avalon, Longlands and Katspruit forms. Utilising this data, coupled with the soil information collected during phase 1 of the Ergo Gold PV project, the soils within the study site were categorised into two separate soil types, the Natural Soils and the Anthrosols and Technosols.

The first group are naturally occurring with the soil morphological expression and sequence of soil horizons being formed without significant human intervention. Anthrosols and Technosols on the other hand, are soils which have been drastically altered by human intervention such that the natural soil properties are no longer identifiable, and an anthropogenic classification is applied. The natural soils were classified as the Mispah,

[1] Phase 1, a 19.9MW PV facility with a 22kV Overhead power line and 100MWh Battery Energy Storage System (BESS) has previously assessed through a Basic Assessment Process).

Glenrosa, Hutton, Nkonkoni and Katspruit soil forms. The Anthrosols and Technosols were classified as the Grabouw, Witbank, Stilfontein and Johannesburg soils forms.

Utilising the soil information, climatic information, and topography, the study site was assessed in terms of the agricultural and land capability potential. The study site has been categorised into the Class III, Class IV, Class V, Class VI, and Class VIII categories. The Class III and Class IV category is classified in areas that contain the natural Mispah/Glenrosa and Hutton/Nkonkoni soils. Class III areas occupy 14.4% of the study site, while Class IV areas occupy 12.39% of the site. The Class V category is reserved for saturated soils and was thus mapped where the Stilfontein and Katspruit soils were identified or are likely to be identified. Class V areas occupy 29.1% of the site. The Grabouw or Physically Disturbed Anthrosol soils have been classified as Class VI areas. Class VI areas have severe restrictions to cropping and are therefore excluded from production under perennial vegetation. Class VI soils occupy 17.9% of the study site. The remaining Johannesburg and Witbank soils are categorised as Class VIII soils. These soils have been completely modified and are not productive for any agricultural activities. Current infrastructure is situated within these areas. The Class VIII areas occupy 26.3% of the study site.

Overall, the study site can be considered to have a low agricultural potential with severe limitations to crop cultivation. The majority of the site (73.3%) is classified as Class V, Class VI, or Class VIII. This is as a result of a combination of factors including the significant long term anthropogenic modifications to the soils of the entire study site, the presence of saturated horizons, whether natural or artificially saturated, and the use of the surrounding landscape for mining and urban activities.

It is recommended that a more in-depth study, with the inclusion of field sampling takes place during the impact assessment phase of this study to ensure the appropriate land capability classes have been assigned to the correct areas. This is especially so in areas where natural soils still remain and are therefore more productive with regards to agricultural activities. During construction activities mitigation measures to lessen the impact of the development on the receiving environment must be implemented. These include:

- erosion control measures such as sandbags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which can be placed along slopes for their protection.
- waste disposal controls for litter and contaminants utilised during construction.
- dust monitoring; and
- alien species control.

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1. INTRODUCTION AND BACKGROUND

1.1. Project Background and Locality

Malachite Ecological Services was appointed by Environmental Management Assistance (Pty) Ltd. to undertake a Baseline Soils, Land Capability and Agricultural Potential Assessment for the proposed construction of a Solar Photovoltaic (PV) plant (phase 2), with a capacity of 40MW to supply power to the existing Ergo Mining (Pty) Ltd Brakpan Plant.

The proposed project is situated off the R23 (Heidelberg Road) on Portions 183, 272 and 283 of the Farm Witpoortje No. 117IR; Portions 9 of the Farm Withok No. 131IR; and Holdings 203-208, 240-245, 296-303 and 348-355 of the Withok Estates I.R.[2], within the Ekurhuleni Local Municipality, Gauteng. The project site is furthermore situated within the quarter degree square 2628AD (Figure 1 and Figure 2).

The primary aim of the assessment is set out in the Natural Resources Survey Specifications document (2012) and is to determine the general soil types in the study area, their land capability and agricultural potential. This will be achieved through a desktop study of the soils within the study site according to the land type data of the area, the previous soil survey undertaken for phase 1 (a 19.9MW PV facility with a 22kV Overhead power line and 100MWh Battery Energy Storage System (BESS) as previously assessed through a Basic Assessment Process) of the Ergo Gold Mine PV project as well as through an investigation into historic and current aerial imagery; the climate of the area; the geology; the erosion hazard; and the water resources. Recommendations resulting from these findings will be aimed at ensuring soil resources are utilised in a sustainable manner.

Soil forms are the primary components creating the pedosphere and are integral in the sustainability of life on earth. They are formed through the integration of five key components, namely: parent material (geology); time; climate; microorganisms; and water. The primary attributes of soil forms include:

- Soils are the primary mediums on earth for biological processes and activity;
- They provide and sustain integral ecological processes including water retention, nutrient cycling, and the organic carbon cycle; and
- The soil characteristics of a particular area determine the botanical and faunal composition. Therefore, soils provide an important system in which the ecology of the area is founded upon.

[2] Please note that a larger area was scoped for inclusivity and to ensure that any sensitive areas within the larger area were identified. This area will be refined for the impact assessment phase based on the proposed PV layout.

South African soils can be classified into approximately 73 forms and further categorised into 14 groups (Fey, 2010). These numbers have been recently extended to 135 forms in 2018 (Soil Working Group, 2018). The classification and identification of these soil forms are based on the presence of defined diagnostic horizons or materials. Ineffective conservation efforts coupled with increased development within South Africa has exerted pressure on these vital soil resources. It is imperative that all developments employ techniques to ensure the conservation of soils forms.

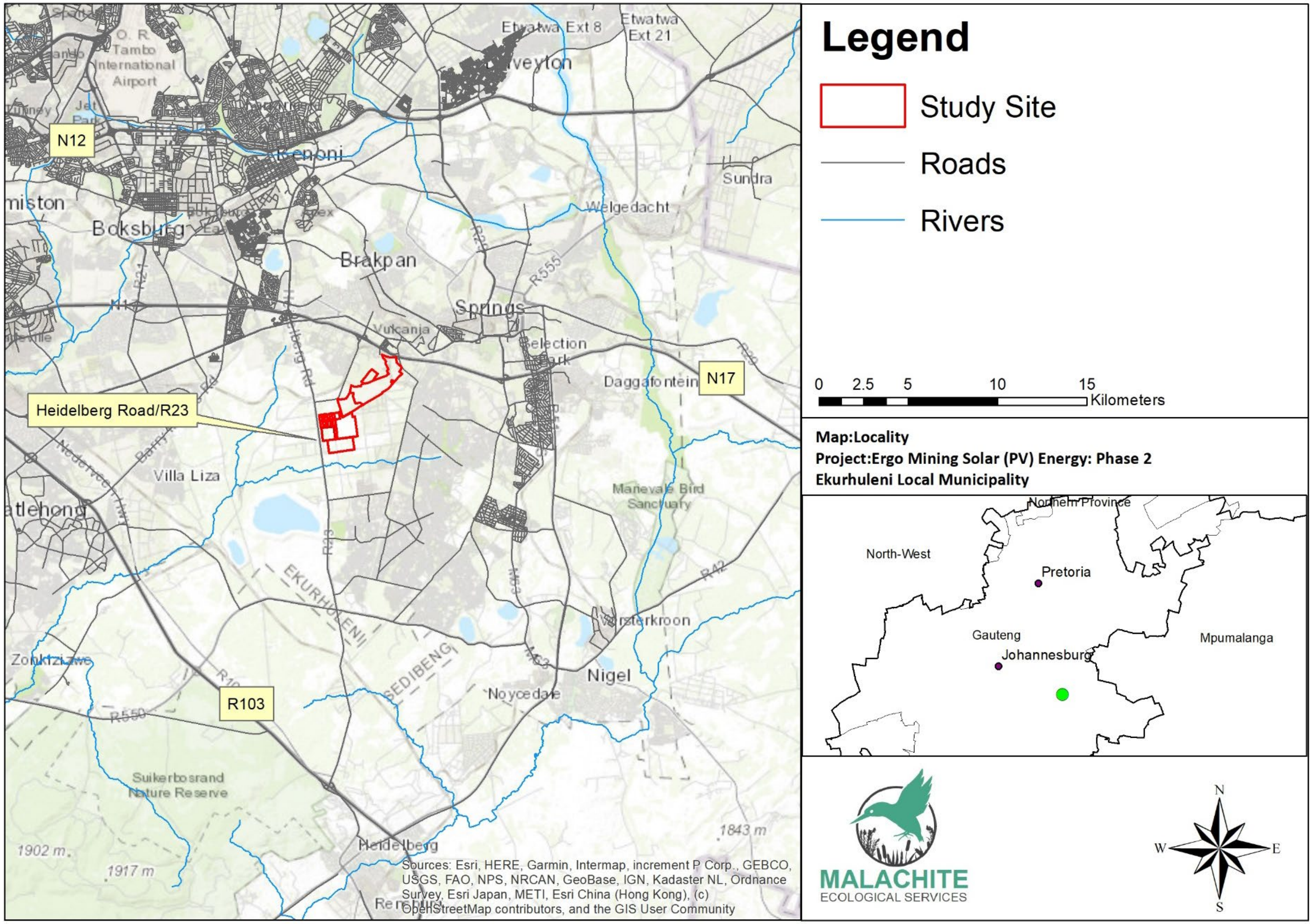

Figure 1: Locality of the study site

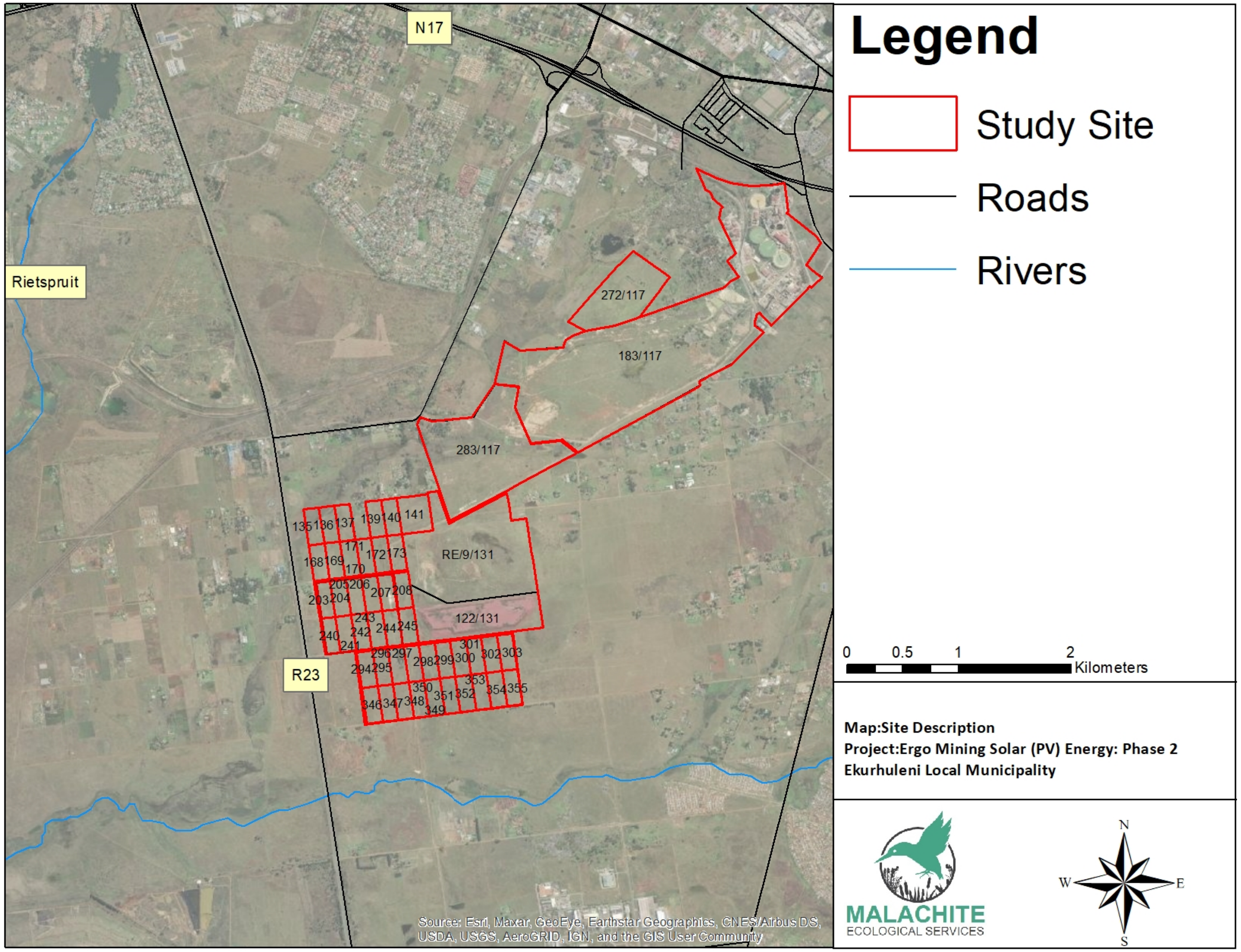

Figure 2: Aerial imagery of the study site showing the farm portions on which the project is situated as well as a larger encompassing area that was scoped

1.2. Scope of the Assessment

The terms of reference for the study were as follows:

- A desktop investigation of the land type associated with the study site. Land Type data is classified according to the Binomial System of 1977. Soil data was extracted from the land type information and re-classified as per the Soil Classification Working Group (2018).
- Describe the geology, topography, watercourses, and climate of the site.
- Describe the agricultural potential of the site based on the information attained from the land type data, phase 1 of the Ergo Gold PV project Soil, Land Capability and Agricultural Assessment (Malachite Ecological Services, 2021); as well as the slope; climatic data, and wetness.
- Recommend actions for the impact assessment phase of this study as well as measures to lessen any potential impacts on the soils within the study site from the proposed development.

1.3. Assumptions and Limitations

It is difficult to apply pure scientific methods within a natural environment without limitations or assumptions. The following apply to this study:

i. Soil sampling was not undertaken during this baseline assessment. As such the soil information of the site is inferred from the Land Type data for the area as well as a previous soil mapping exercise conducted for phase 1 of the Ergo Gold Mine PV Facility project.
ii. The Land Type data is not specific to the study site but rather allows for a general understanding of the soil types present within the larger area.
iii. Soils classified as suitable to arable agriculture are also suited to other less intensive agricultural land uses, for instance pasture, natural grazing, and wildlife.
iv. Soil fertility status was not undertaken in this assessment.

1.4. Reporting Conditions

The findings and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as information available at the time of compilation. No form of this report may be amended without the prior written consent of the author.

2. METHODOLOGY

2.1. Desktop Study Methodology

The desktop study involved the examination of aerial photography and Geographical Information System (GIS) databases. The study made use of the following data sources:

- Google Earth™ satellite imagery was used at the desktop level.
- Relief dataset from the Surveyor General was used to calculate slope.
- Climatic data was obtained using a dataset from 1982 to 2012 on the climate-data.org website.
- Historical imagery from 1938 was obtained from the Department of Rural Development and Land Reform and the National Geospatial Information website (http://cdngiportal.co.za/cdngiportal/).
- Geology dataset was obtained from AGIS[3].
- Vegetation type dataset from Mucina & Rutherford (2006), with amendments by SANBI (NBA, 2018) were used in determining the vegetation type of the study area.
- The National Wetland Map 5 dataset (Van Deventer et al, 2018) was used in determining any wetlands and watercourses within the study site.
- Soil and agricultural resources within South Africa are governed by legislation and these legislative requirements were consulted, including:
    - Spatial Planning and Land Use Management Act (No. 16 of 2013).
    - Conservation of Agricultural Resources Act (No. 43 of 1983).
    - Chapter 11 of the Nature Conservation Ordinance (No. 15 of 1974).

Topography was also considered during this assessment, as together with soil form, it plays a large part in determining the land potential of the study site as well as any rehabilitation measures that may need to be taken. Lastly, climate is used as an important determinant in the agricultural potential of the site. Climate determines the volume of precipitation, the type of precipitation, the seasonal occurrence, soil moisture, evaporation rate, as well as the effect of sunshine hours, heat and chill units on crop yield and ground cover.

The information gathered from the desktop assessment was utilised to produce the soil and land capability maps.

[3] Land type information was obtained from the Department of Agriculture's Global Information Service (AGIS) January 2014 – www.agis.agric.za

3. BASELINE DESCRIPTION

3.1. Local Climatic Conditions

The Ergo Gold Mine is situated within an area characterised by summer rainfall patterns with sporadic rainfall events during the winter months. The mean annual precipitation is 692mm, with the bulk of the rainfall occurring between September and March (summer months). These high intensity rainfall conditions are conducive to high levels of surface runoff and subsequent erosion where soils are shallow, occur on steep slopes or are overgrazed. The wettest time of the year is January with an average of 123mm and the driest is June and July with 7mm (Table 1). The seasonality of precipitation is a driving factor behind the hydrological cycles of water resources within the area. Typically, watercourses have a higher flow rate during the summer months.

Mean temperatures vary between 9.7^{O}C to 19.7^{O}C for the Brakpan region (Table 2). The area is coldest in July with average minimum temperatures of 2.8^{O}C and hottest in November and December with average maximum temperature of 25.2^{O}C on average (Climate-data.org; Mucina & Rutherford, 2006; updated 2018).

Table 1: Mean annual rainfall data for the Brakpan area

	January	February	March	April	May	June	July	August	September	October	November	December
Mean Rainfall (mm)	123	96	86	42	19	7	7	9	24	65	105	109

Table 2: Temperature data for the Brakpan area

	January	February	March	April	May	June	July	August	September	October	November	December
Mean Temperature (^{O}C)	19.7	19.6	18.4	15.7	12.8	10	9.7	13	16.8	18.5	18.9	19.7
Max Temperature (^{O}C)	25	24.9	23.9	21.5	19.6	17.3	17.4	20.9	24.6	25.7	25.2	25.2
Min Temp (^{O}C)	14.8	14.6	13.2	10.2	6.5	3.5	2.8	5.6	9.1	11.6	12.9	14.6

3.2. Geology

South Africa is a semi-arid country with differences in rainfall patterns, topography, and geology. The geological characteristic of an area influences the topography, soil types and textures, vegetation communities and faunal assemblages present.

The study area is underlain predominantly by the Ecca Group of the Madzaringwe Formation of the Karoo Supergroup. The geology of this region is primarily known to be sedimentary strata and is a very thick sequence of carbonaceous siltstone, mudstone, shale, sandstone, and coal (www.agis.agric.za).

3.3. Regional Vegetation structure and composition

The study area is located within the Grassland Biome. According to the latest regional vegetation classification for South Africa (Mucina & Rutherford, 2006; updated 2018), the study area falls within the Soweto Highveld Grassland and the Tsakane Clay Grassland vegetation types, with the majority of the site with the latter vegetation type (Figure 3).

The Tsakane Clay Grassland unit is distributed throughout Gauteng and Mpumalanga in areas characterised by flat to slightly undulating plains and low hills. The community structure is comprised of short, dense grassland dominated by a mixture of common highveld grasses such as *Themeda triandra, Heteropogon contortus*, *Elionurus muticus* and a number of *Eragrostis* species. The dominant forbs are of the families Asteraceae, Rubiaceae, Malvaceae, Lamiaceae and Fabaceae. Disturbances within these grasslands changes the vegetation dynamics, with an increase in the abundance of *Hyparrhenia hirta* and *Eragrostis chloromelas* noted. Erosion is generally very low.

This vegetation unit is classified as Endangered, with only 1.5% conserved in statutory reserves. The latter was confirmed in the NBA (2018) which indicates that the vegetation type is Poorly Protected, with an estimated over 60% transformed for cultivation, urbanisation, mining, dam-building, and roads.

A small portion of the north-eastern extent of the study site is located within the Soweto Highveld Grassland vegetation type (Figure 3). This vegetation type is also present largely in Gauteng and Mpumalanga on gently to moderately undulating landscapes on the Highveld Plateau. It supports short to medium-high dense tufted grassland dominated almost entirely by *Themeda triandra*. Other grasses are also present including *Elionurus muticus, Eragrostis racemose, Heteropogon contortus* and *Tristachya leucothrix*. This vegetation type is classified as Vulnerable within the NBA (2018) database with only a handful of patches statutorily or privately conserved. Over 50% has been transformed by cultivation, urbanisation, mining, dam-building and roads. Erosion is generally very low.

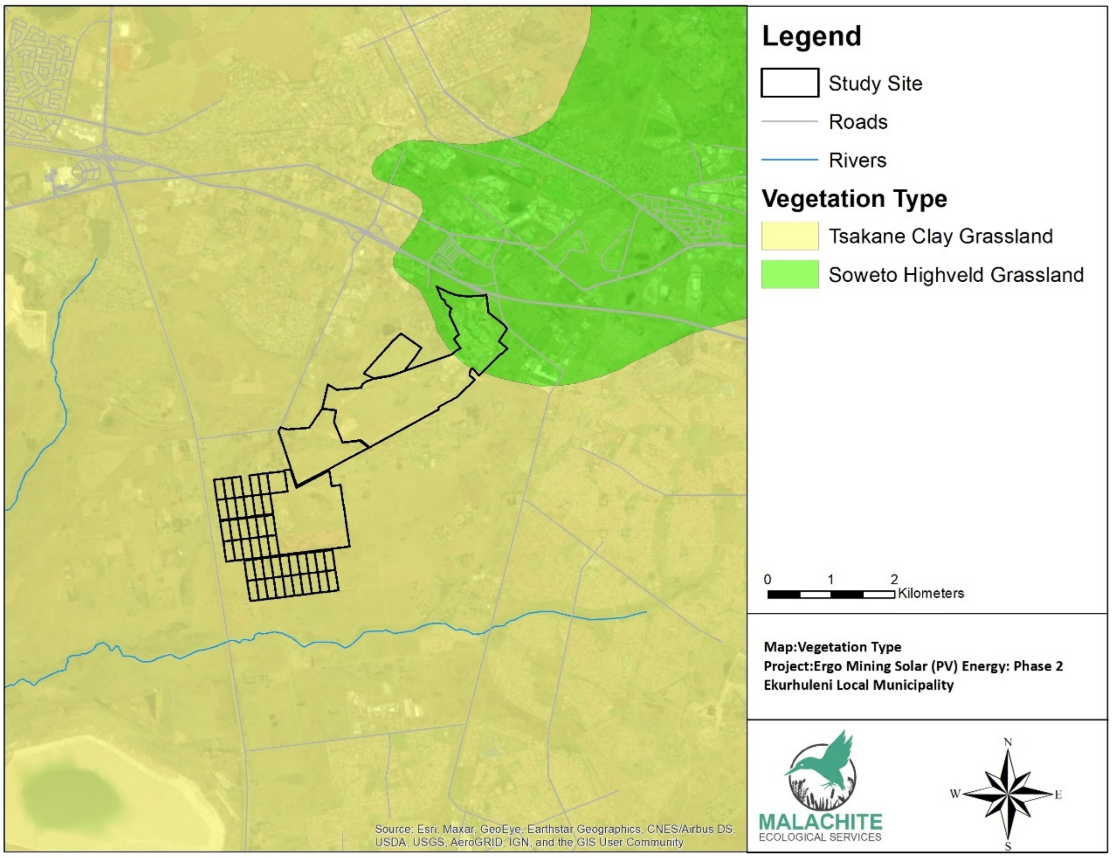

Figure 3: Regional vegetation associated with the study site

3.4. Catchment characteristics and watercourses

The project area lies within the Vaal Water Management Area. Major rivers within this WMA include the Wilge, Liebenbergsvlei, Mooi, Renoster, Vals, Sand, Vet, Harts, Molopo and Vaal. These rivers experience significant levels of high-water demand related stress, particularly during drought seasons. Many of the surrounding communities rely on fresh water from these rivers throughout the year to supply adequate water for domestic, stock and irrigation.

More specifically, the project area is situated within the C22C Quaternary Catchment (Figure 4). The Rietspruit flows approximately 2.7km to the west of the study site with a tributary of this river flowing approximately 1.5km to the south of the study site. Non-perennial drainage channels are also located within the study site.

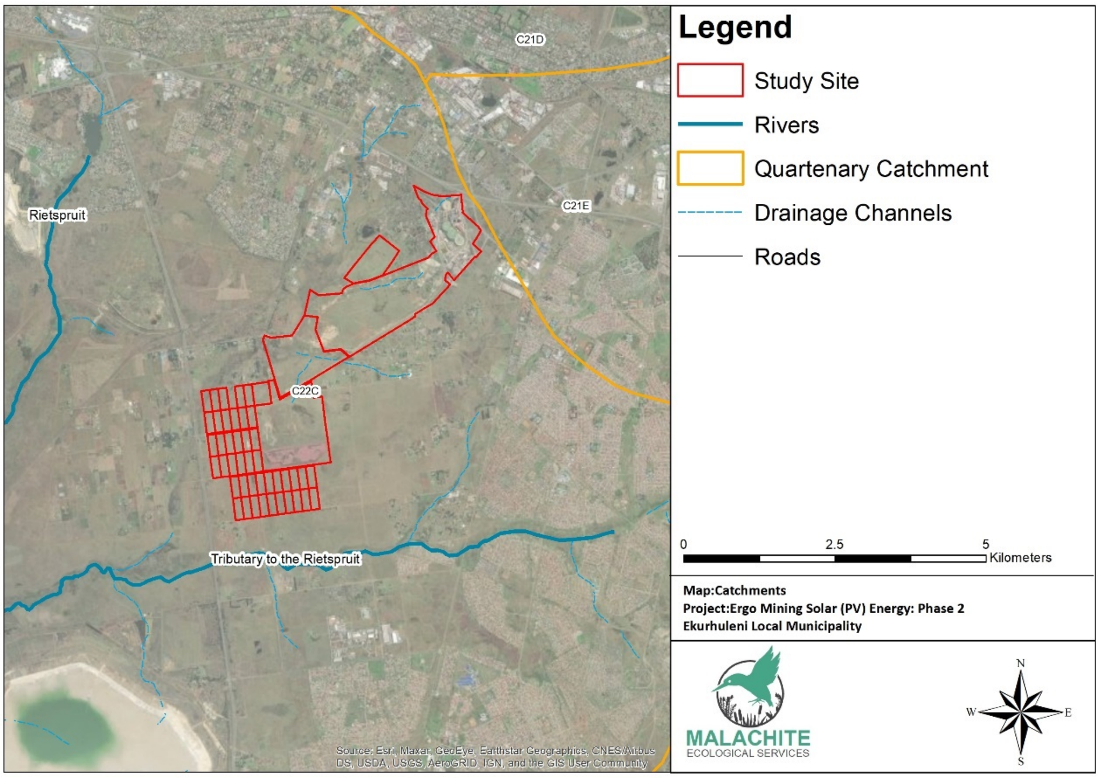

Figure 4: Quaternary catchment location and watercourse systems

3.5. Wetland systems

The recent publication of the National Wetland Map 5 (Van Deventer et al, 2019) (NWM5) database forms part of the National Biodiversity Assessment (2018), within the category of the Inland Aquatic (Freshwater) Realm. This project is a multi-partner project through the CSIR and SANBI. The NWM5 has significantly improved the representation of inland wetland ecosystem types. The representation of the extent of inland wetlands has improved by 123%, whereas the incorrect representation of terrestrial ecosystems as wetlands has been reduced (Van Deventer et al, 2018).

The NWM5 was utilised to assess the project area. As shown in Figure 5, a number of unchannelled valley bottom wetlands, and depressions/pans are located within the study site. These systems are often utilised for agricultural production leading to negative impacts on their health and functional integrity. The protection of wetland systems forms part of the National Water Act (36 of 1998) and the delineation and assessment of these systems is detailed in the Baseline Wetland and Aquatic Assessment (Malachite Ecological Services and Ecology International, 2021).

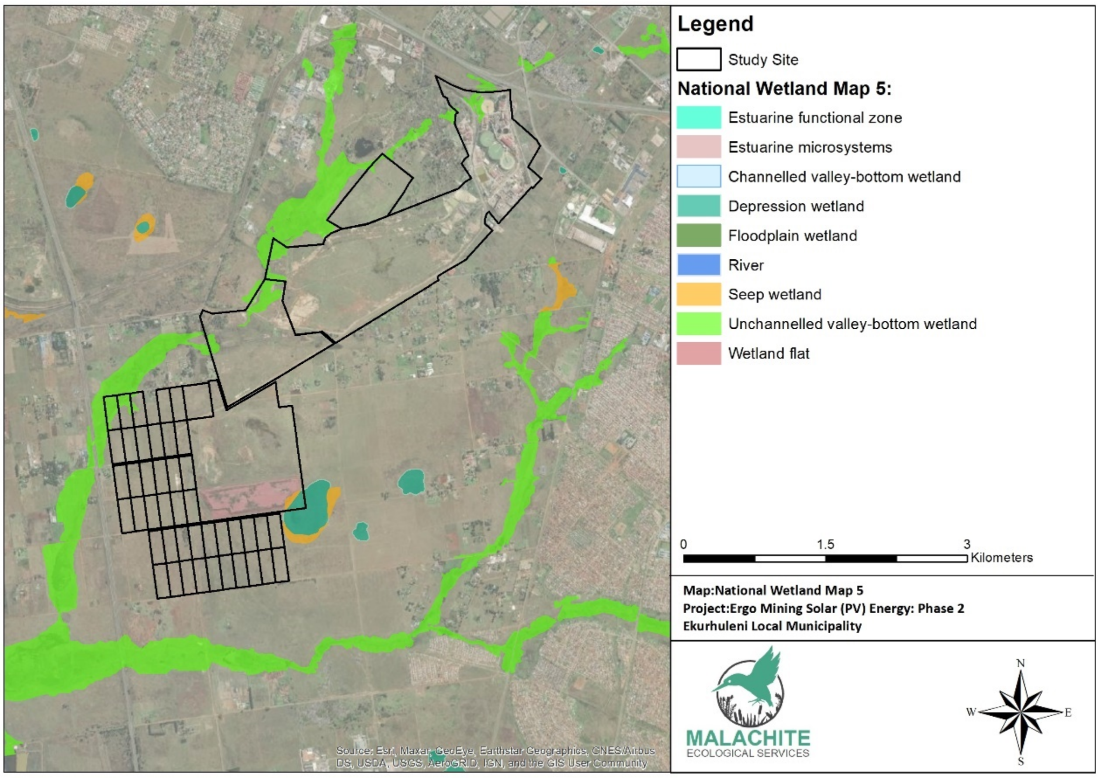

Figure 5: Wetland systems surrounding the site as per the National Wetland Map 5 database

3.6. Topography

The project area is situated on a gently undulating landscape. Average slopes are between 2% to 2.5% with maximum slopes of 11% within the northern section of the study site, where the existing Ergo Gold Mine Brakpan Plant is located. The altitude ranges from 1583m above sea level (absl) in the south-eastern portion of the study site and rises to 1659m absl in the northern extent of the study site (Figure 6). Topography is not considered a limitation to agricultural production.

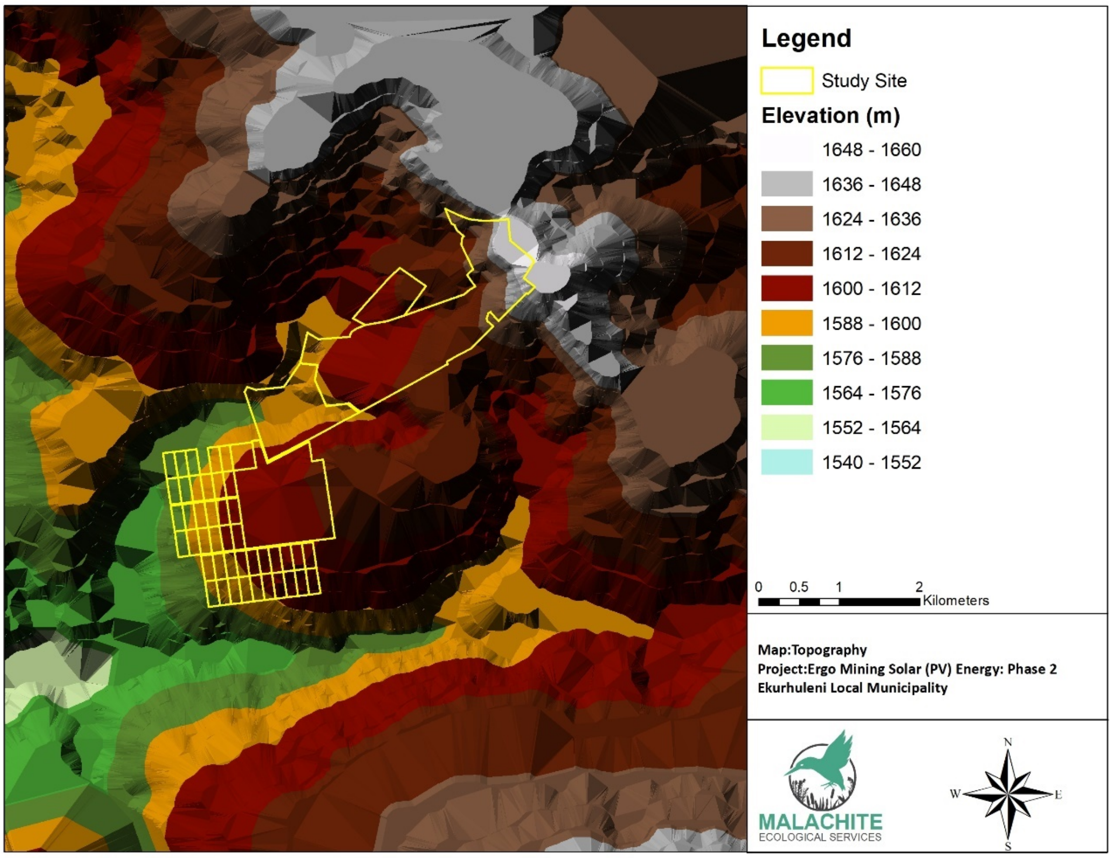

Figure 6: Topography of the site showing the range in altitude

3.7. Historic and Current Land Use

An investigation into historic aerial imagery of the site was undertaken. Portions of the study site are visible in historical aerial imagery from 1938 (Figure 7). In this imagery, development within the area is apparent with mining operations underway at the current location of the Brakpan Plant. Development is furthermore noted in the form of roads and scattered residential buildings. Agricultural activities, particularly the cultivation of crops can be seen throughout the study site outside of and adjacent to watercourses. The historic Tsakane Clay Grassland vegetation type is furthermore evident in the imagery, particulary in undisturbed portions of the site. These areas were most likely used for the grazing of livestock.

Figure 7: Historic aerial imagery from 1938 showing portions of the study site, with mining already underway, the creation of road networks and the cultivation of crops

In imagery from 1985 the use of large portions of the site as mining areas and/or tailings dams is clearly evident (Figure 8). Dams are indications of the disturbed nature of the study site as a result of the use of this area for mining activities, with the soil profiles in these mined areas forever changed by these activities. These impacts on the soils within the study area reduce the likelihood of the use of these areas for crop cultivation in the future.

Figure 8: Historic aerial imagery from 1985

Aerial imagery from 2002 shows the mining and remining of the central to southern portions of the study site (Figure 9). Haul roads, mining operations, and the continued transformation of the site is apparent in the aerial imagery. Areas adjacent to the mining operations, but still within the study site are no longer utilised for the cultivation of crops, with the exception of Farm Portion 272 of the Farm Witpoortjie 117 in the central to northern portion of the study site.

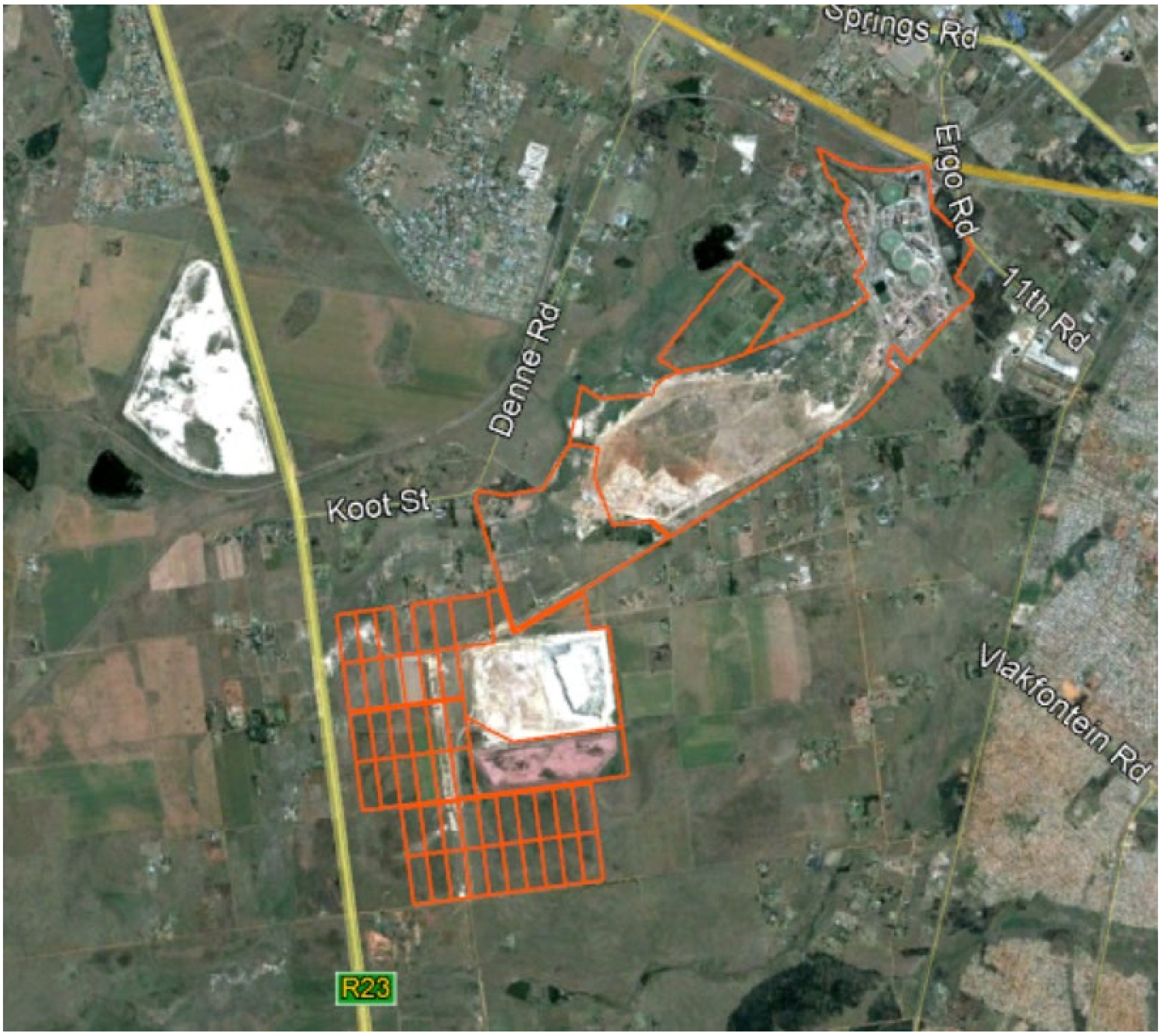

Figure 9: Aerial imagery from 2002

Mining was then discontinued within the study site and the rehabilitation of the area undertaken, from approximately 2004/2005. Soil is seen to be deposited within the disturbed sites as well as the re-grassing of these areas. This is shown in aerial imagery from 2008 (Figure 10). Topsoil stockpiles are still evident in the southern portion of the study area. Furthermore Portion 272 of the Farm Witpoortjie 117 is no longer utilised for crop cultivation.

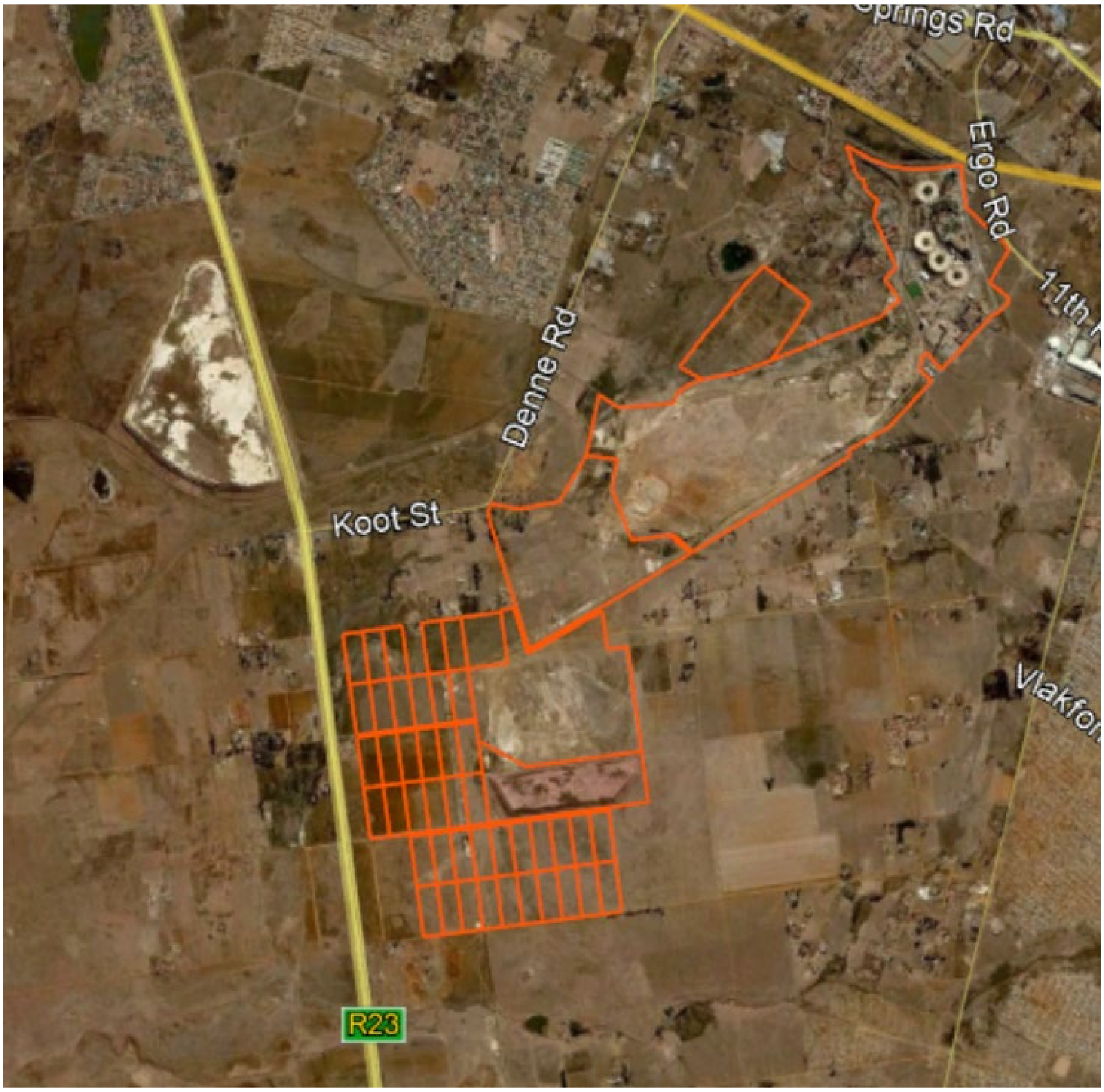

Figure 10: Aerial imagery from 2008

The most current aerial imagery available on Google Earth[Tm] is from April 2021 (Figure 11). This shows the completed rehabilitation process of the disturbed portions of the study site, with these areas now grassed areas. Small scale crop cultivation is apparent on Portion 272 of the Farm Witpoortjie 117, with various areas within the study site utilised for livestock grazing. The operations associated with historic and current mining activities however dominate the area and have had an impact on the quality of the soils within the study site. This is detailed further in the following sections.

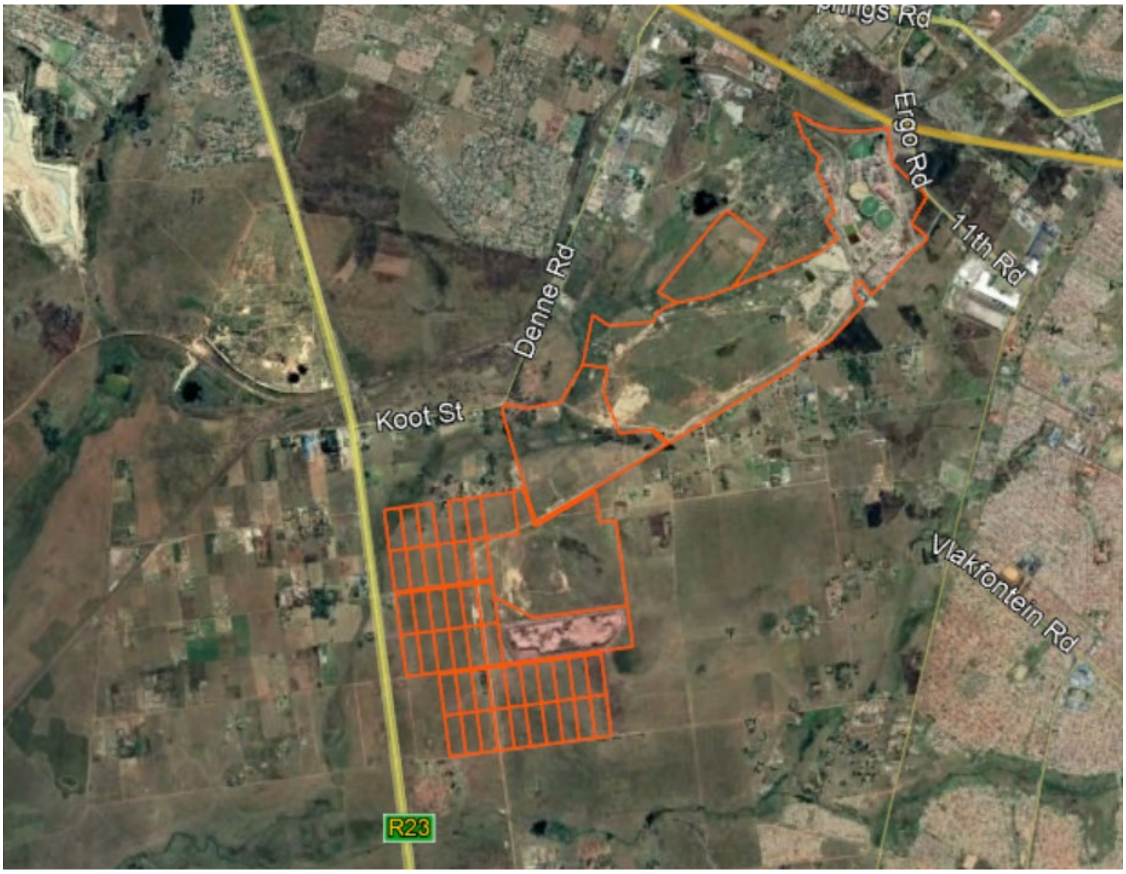

Figure 11: Current imagery from April 2021

4. ASSESSMENT RESULTS – SOIL SURVEY

4.1. Land Type Data

Land type data for the site was obtained from the Agricultural Research Council (ARC). The land type data is presented at a scale of 1:250 000 and entails the division of land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System. The soil data was interpreted and re-classified according to the Taxonomic System (Land Type Survey Staff, 1972-2006).

The majority of the study site is situated in the Bb3 land type with a portion of the northern extent of the site situated within the Ba1 land type (Figure 12). The B land types represent a large proportion of the interior of South Africa and is made up of plinthic soils. Plinthic soils indicate a fluctuating water table. Hillslope catenas within these land types are represented by the soil forms Hutton, Bainsvlei, Avalon, and Longlands. Valley bottoms consisting of a gley soils such as the Katspruit soil form or Willowbrook, Rensburg or Champagne. In the Ba and Bb land types the plinthic character of soils makes up more than 10% of the area.

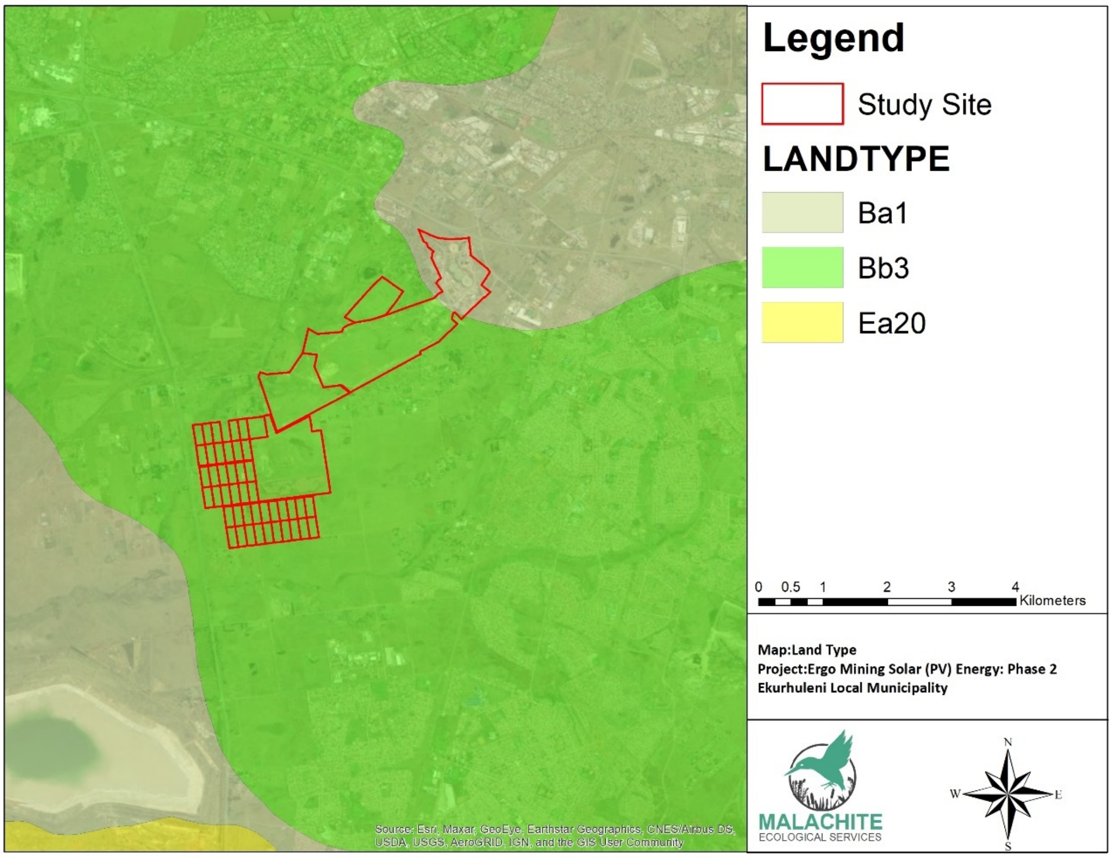

Figure 12: Land Type data associated with the study site

4.2. Soil Assessment

Taking into account the historic and current aerial imagery as well as a previous soil mapping exercise conducted for phase 1 of the Ergo Gold PV project, the study site was divided into two separate soil types, the Natural Soils and the Anthrosols and Technosols.

The first group are naturally occurring with the soil morphological expression and sequence of soil horizons being formed without significant human intervention. Anthrosols and Technosols on the other hand are soils which have been drastically altered by human intervention such that the natural soil properties are no longer identifiable, and an anthropogenic classification is applied.

According to the 2018 Soil Classification Working Group, Anthrosols are soils which have been drastically changed by intentional human activity to improve productivity of an area. Technosols are soils that comprise material from mining, industry, construction, or urban activities that often supply parent material for new anthropogenic soils. They may also be created from alteration of natural soils by physical, chemical, or hydrological processes resulting from mechanical working, water diversion, pollution, and/or extraneous additions of harmful solids or liquids. Table 3 shows the Anthrosols and Technosols identified within the site as well as their soil class as per Figures 13, 14 and 15.

Table 3: Anthropogenic soil materials and associated classes identified in the site

Type of Anthropogenic Material Identified in the site	Soil Class
Physically Disturbed Anthrosols	Grabouw
Transported Technosols	Witbank
Hydric Technosols	Stilfontein
Urban Technosols	Johannesburg

The majority of the central portion of the study site, particularly within Portions 183 and 283 of the Farm Witpoortjie 117 and Portion 9 of the Farm Withok 131 I.R was classified as the Physically Disturbed Anthrosol, Grabouw. This soil form is physically disturbed as a result of historic and current activities and includes areas where the soils have been mixed, compacted, or excavated by human activity. Adjacent to the Grabouw soils, in areas which have been converted to infrastructure, the soils were classified as the Urban Technosol, Johannesburg. Urban Technosols encompass the whole spectrum of urban development and for the study site, the classification includes the buildings and mining operations of the Brakpan Plant, the gravel roads, and the slurry pipelines. The Witbank soil, which is another Technosol, a Transported Technosol, was classified in an area which serves as a stockpile for historic mining operations. Transported Technosols include any relatively fine or crushed material which has been intentionally transported from a separate location and deposited on the land surface.

The final Technosol encountered within the study site, the Hydric Technosol Stilfontein, was classified in areas which have undergone saturation for an extended period of time. This classification is also applied to former wetland soils that have suffered altered soil properties resulting from direct human intervention. The classification was applied to areas which have undergone historic transformation to tailings dams, remined areas, rehabilitated areas, as well as areas currently used to convey water for mining operations. The alteration to the natural topography and drainage of the majority of these areas has furthermore caused ponding of stormwater. These saturated areas display hydric properties both at the surface of the soil as well as within the lower reaches of the soil profile and include gleying of the soil matrix as well as distinct and a high concentration of mottles and concretions.

Scattered throughout the study area, between the Anthrosols and Technosols, natural soil profiles are also apparent. These are classified as either Mispah/Glenrosa soils, Hutton/Nkonkoni soils or the Katspruit soils.

The Mispah and Glenrosa soil forms are categorised as belonging to the Lithic class. Lithic soils are characterised by hard rock or saprolite dominating the soil profile. Mispah soils are characterised by an Orthic A horizon overlying hard rock, while Glenrosa soils are characterised by an Orthic A horizon overlying a lithic horizon (weathering rock). These soils are often identified on convex and steeper slopes where natural erosion keeps pace with weathering and the result is shallower soil profiles. These Mispah/Glenrosa soils are mapped in the south-western portion of the study site in Holdings 203-208, 240-245, 296-303 and 348-355 of the Withok Estates I.R.

To the south of the Mispah/Glenrosa soils, in Holdings, 203-206, and 240-243 Withok Estates I.R, the Hutton/Nkonkoni soil forms were mapped. Furthermore, these soils were mapped in parts of Portion 272 of the Farm Witpoortjie 117. The Hutton/Nkonkoni are categorised as belonging to the Oxidic soil class. Oxidic soils have a B horizon that is uniformly coloured with red and/or yellow oxides of iron. These soils exhibit a broad geographic distribution in South Africa and are considered mature soils, coupled with free drainage in the upper solum of the soil profile. The Nkonkoni soil form consists of an orthic A horizon overlying a red-apedal B horizon which overlies a lithic horizon. The Hutton form is the same as the Nkonkoni form, with the red-apedal horizon being much thicker in this soil form.

Within the more permanently saturated sections of channelled valley bottom wetland system, along the northern boundary of the study site, as well as a depression system in the southern point of the site, the Katspruit soil form was mapped. This soil form belongs to the Gleyic soil class. Gley soils display reduction and are located within saturated environments. They are considered wetland soils and are generally identified in the low-lying parts of the landscape. The Katspruit soil form consists of an orthic A horizon overlying a gley horizon and this saturated horizon.

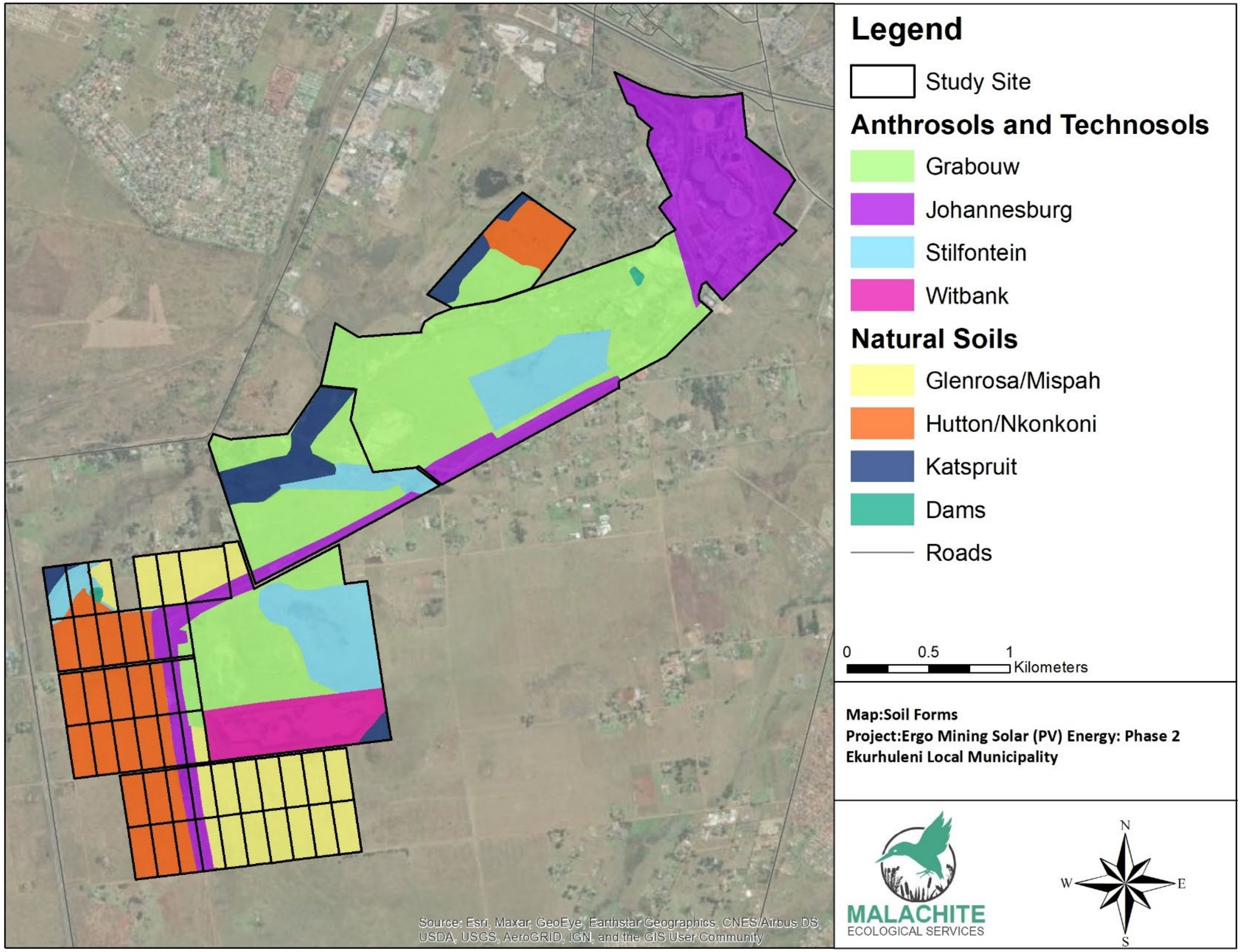

Figure 13: Soils associated with the study site

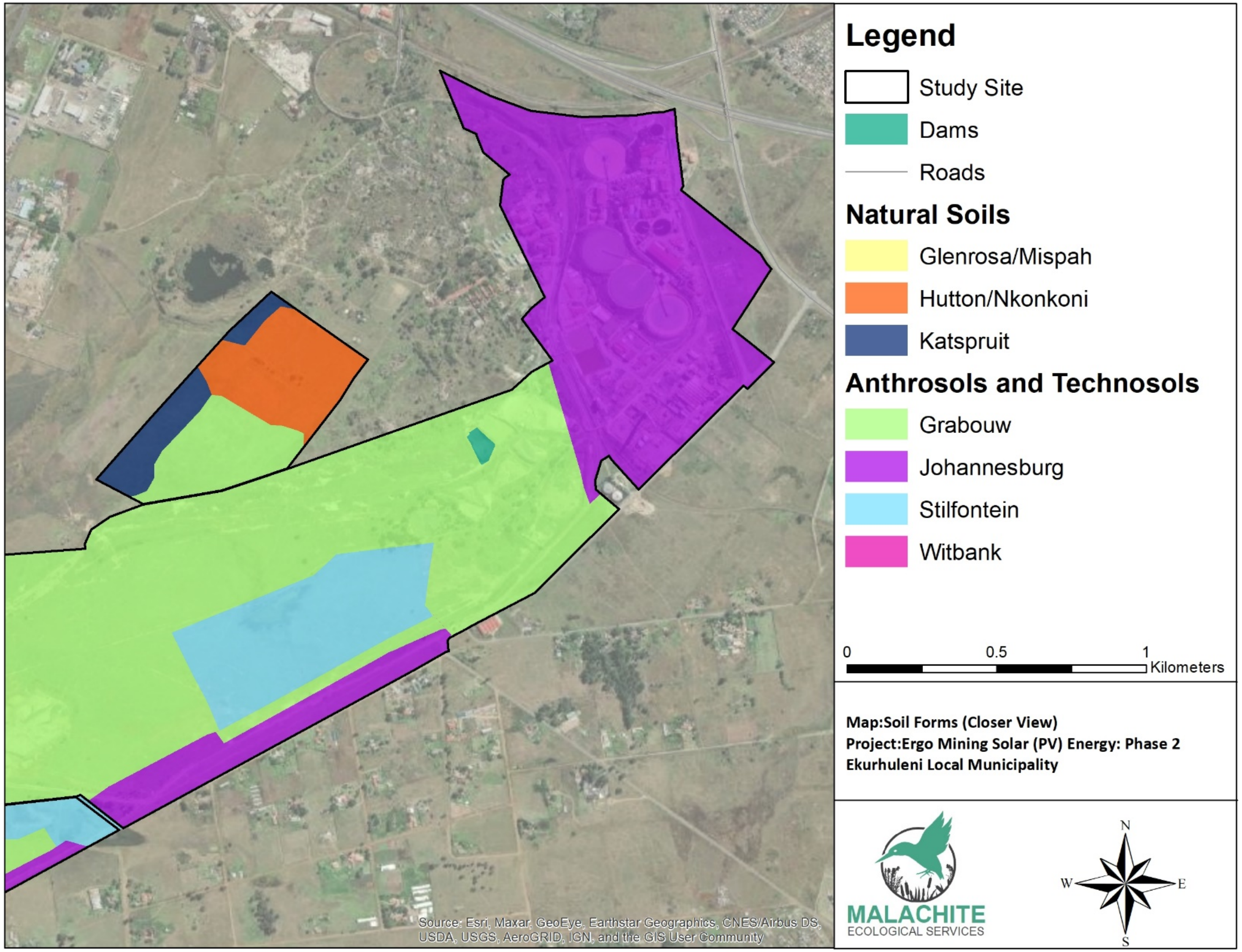

Figure 14: Closer view of the soils associated with the study site

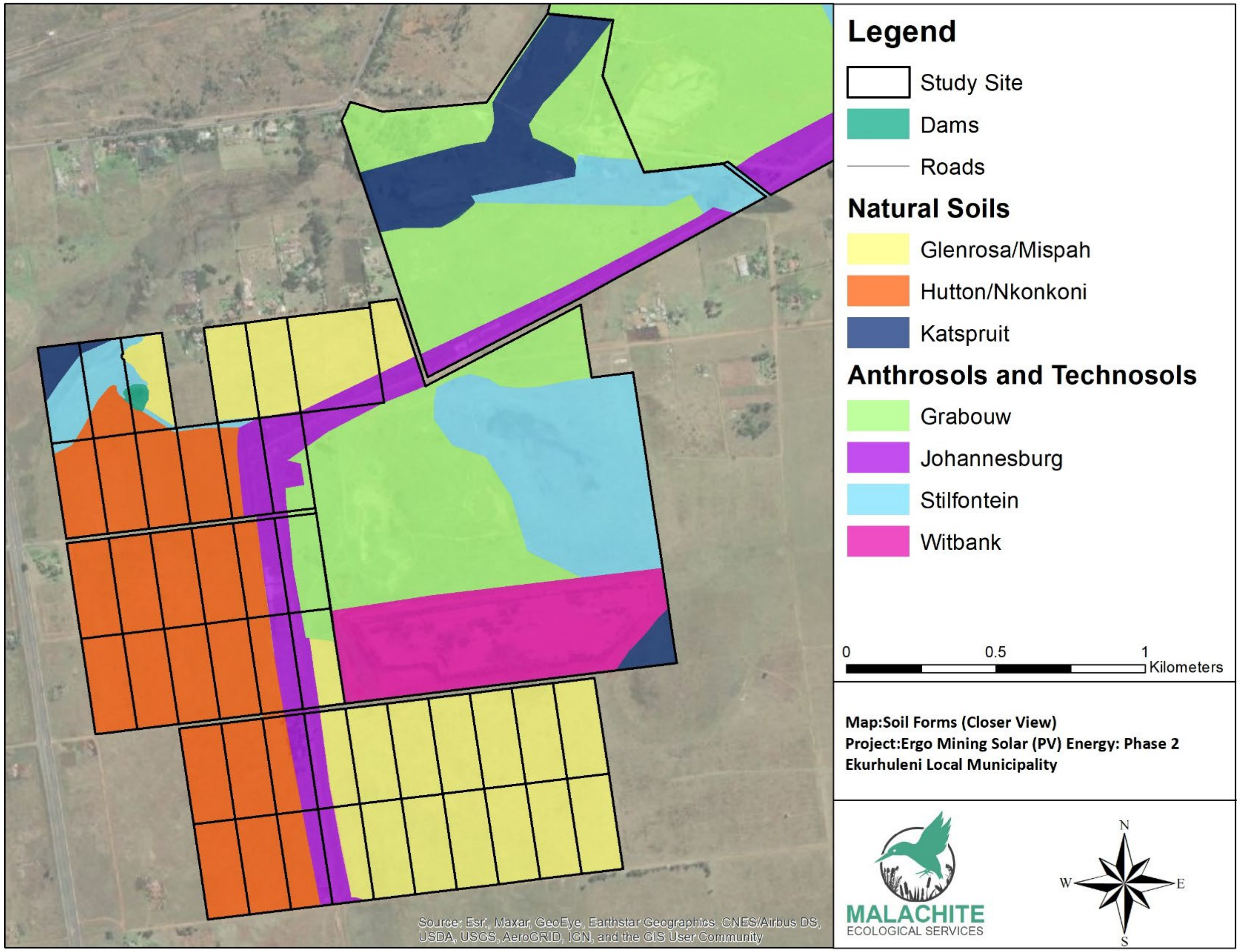

Figure 15: Closer view of the soils associated with the study site

5. SOIL AGRICULTURAL POTENTIAL

Land evaluation is the process of estimating the production potential for alternative land uses. The physical data acquired from soil profiles is applied to a flow sheet adapted to South African conditions from the US Department of Agriculture standards and utilised by land usage authorities as the basic template for benchmarking soil quality throughout South Africa.

Land capability evaluation is an attempt to grade the potential of the land in terms of its best and worst uses in an arable situation. The land is classified according to its limitations, either on a permanent or temporary basis. The system is biased towards soil conservation and is based on the negative features of the land. The classification system is categorised on a scale of I to VIII so yield potential matrices can be easily formulated. LCC I to LCC III classes are suitable for arable crops. LCC IV can sometimes be cultivated for annual crops, but under carefully controlled conditions. LCC V are usually wetlands while LCC VI, VII and VIII soils are suited to domestic livestock and wild game only. Table 4 reflects the LCC of each Class. The flowsheets used to determine Land Capability Class are shown in Appendix A.

Table 4: Land capability classification descriptions (US Department of Agriculture, 1961)

Class	Description
I	Little to no limitations, high potential for intensive arable use.
II	Land subject to certain limitations or hazards. It is suitable for cropping with adequate protection measures, which may sometimes include special management practices and regular rotations.
III	Land subject to moderate limitations or risk of damage, which is suitable for cropping only with intensive protection measures and special practices, which may include long ley rotations with short cropping periods
IV	Land subject to severe permanent limitations or hazards. Suitable for occasional row cropping in long ley rotations, or for use under perennial vegetation. Limitations may include steep slopes, shallow soils, soils of very low water-retaining capacity, high erodibility, unfavourable characteristics in the surface soil, and severe, but correctable, wetness.
V	Watercourses and land subject to wetness limitations. These limitations include temporary, periodic and semi-permanent wetness. Cultivation is only permitted with very special practices and measures. Vleis and watercourses subject to severe wetness are best left under permanent vegetation.
VI	Land which has such severe soil and/or slope limitations that cropping must be excluded but which is productive under perennial vegetation but is susceptible to moderate erosion.
VII	Not suited for cultivation, severe limitations for grazing or farming.
VIII	Extremely rough, suited only for wildlife or recreation.

The primary function of land evaluation is to predict the possible effects, both detrimental and beneficial for a change in land use.

The most important soil and landscape characteristics when applying this system are texture (Clay %), soil depth, permeability, slope, rockiness, surface crusting and wetness. These characteristics of the soils associated with the study site have been inferred from the Land Type data as well as a soil sampling exercise conducted for phase 1 of the Ergo Gold PV project. They are therefore based on the general characteristics of the soils associated with the area.

- **Soil texture:** During the phase 1 soils assessment of the Ergo Gold PV project, a soil sampling exercise was conducted within portions of the study site. The texture of the soils sampled revealed silty clay or silty clay loam soils, with the majority of soils falling into the latter classification. Clay percentage for these texture classes ranges from 25-40% for the silty clay loam soils and 40-60% for the silty clay soils. These clay percentages are not expected to be a limitation to crop production, with a slight restriction in the clayey soils associated with the silty clay texture class. The clay percentage increases for the Katspruit soils, and these soils will have a limitation to crop cultivation.
- **Soil depth:** As with the soil texture a number of soil profiles were examined during phase 1 of the Ergo Gold PV project. These soil profiles had depths ranging from 50mm to 1000mm, however the majority of soils were identified to be within the 300-700mm depth class. The soils were generally shallow as a result of both historic and current anthropogenic activity causing compaction, soil mixing and saturation. These depths are considered a limitation to crop production, with the study site only really suitable for shallow rooted vegetables or grass pastures. Depth limitations that are specific to the entire study area will need to be explored more during the impact assessment phase of this study.

  Soil permeability: Due to the anthropogenic impacts to the majority of the study site, as well as the findings of phase 1 of the Ergo Gold PV project, the permeability of the majority of the soils are likely to be restrictive for crop production. The Anthrosols and Technosols will be restrictive to crop production as a result of compaction, soil mixing, and the presence of artificial hydric soils and stormwater ponding. Within the areas classified as having more natural soils, the presence of shallow rock in the areas classified as Mispah soils as well as the gleyed properties associated with the Katspruit soils will have an impact on the permeability of the soils. The Glenrosa and Hutton/Nkonkoni soils will be more permeable, and these soils are likely to not be restrictive for crop production. This will need to be studied in more depth during the impact assessment phase of this study.
- **Slope:** There is a wide range in slopes, which for the land capability classification, have been grouped as follows:
  - 0-8% - land, which depending on soil profile characteristics is potentially in Class II
  - 8-12% - land, which depending on soil profile characteristics is potentially in Class III

    - 12-20% - land, which depending on soil profile characteristics is potentially in Class IV
    - >20% - land, which is in Class VI or even VII, on slopes greater than 40%.

  The site consisted of gentle terrain with all slope percentages recorded in the 0-8% category. Slope is therefore not a limitation to cultivation.
- **Rockiness:** Rockiness was not identified as a limitation to cultivation within phase 1 of the Ergo Gold PV project. Surface rocks were encountered during the field investigation for this phase, particularly in areas that have been classified as Anthrosols and Technosols as these were deposited in the area. However, the rocks did not pose a major limitation to the site. The area classified as the Witbank soil form will have a limitation to agricultural production as this is a transported soil and rock mixture.
- **Crusting:** During phase 1 of the Ergo Gold PV project, crusting was not found to be a major limitation to cultivation. It is unlikely that this will be a limitation within the study site.
- **Wetness:** Portions of the study site are categorised as either the Hydric Technosol, Stilfontein as a result of historic and current impacts to the soils, or the natural hydric soil, Katspruit, identified within wetland systems. The wetness of portions of the study site is therefore due to both natural and anthropogenic disturbances and these areas are not suitable for crop production.

Taking into account the above factors, the study site has been categorised into the Class III, Class IV, Class V, Class VI, and Class VIII categories (Figure 16).

The Class III and Class IV category is classified in areas that contain the natural Mispah/Glenrosa and Hutton/Nkonkoni soils. The Hutton/Nkonkoni soils are productive with regards to crop cultivation as they are well drained, generally rich in minerals and nutrients and have the depth required to sustain a number of crops. These areas are classified as Class III and occupy 14.4% of the study site. The hard rock or lithic horizon associated with the Mispah and Glenrosa soils can be a limitation to crop production, particularly if it is identified at shallow depths. Within phase 1 of the Ergo Gold PV project, hard rock and the lithic horizon was identified at depths ranging from 300mm to 700mm, and thus it is considered a limitation to crop production. As such, these areas are classified as Class IV and occupy 12.3% of the site.

The Class V category is reserved for saturated soils and was thus mapped where the Stilfontein and Katspruit soils were identified or are likely to be identified. These soils show a high degree of mottling and gleying and indicate a shallow water table for most of the year. The soils are either anthropogenically modified, in the case of the Stilfontein soils or form part of wetland systems in the case of the Katspruit soil form. Cropping in these areas would require intensive protection measures and special practices such as the drainage of the soil. Class V areas occupy 29.1% of the site.

The Grabouw or Physically Disturbed Anthrosol soils have been classified as Class VI soils. Class VI soils have severe restrictions to cropping and are therefore excluded from production under perennial vegetation. This is due to the anthropogenic disturbances to these soils and the use of the soils for human activity. Class VI areas occupy 17.9% of the study site.

The remaining Johannesburg and Witbank soils are categorised as Class VIII soils. These soils have been completely modified and are not productive for any agricultural activities. Current infrastructure is situated within these areas. These areas occupy 26.3% of the study site.

Overall, the study site can therefore be considered to have a low agricultural potential with severe limitations to crop cultivation. The majority of the site is classified as Class V, Class VI or Class VIII (73.3%) (as read with *Table 4*). This is as a result of a combination of factors including the significant long term anthropogenic modifications to the soils of the entire study site, the presence of saturated horizons, and the use of the surrounding landscape for mining and urban activities. Portions of the site are considered acceptable for crop production; however, these are small in comparison to the non-suitable areas. The areas classified for crop production will furthermore require more in-depth examination during the impact assessment phase of this study to determine their suitability.

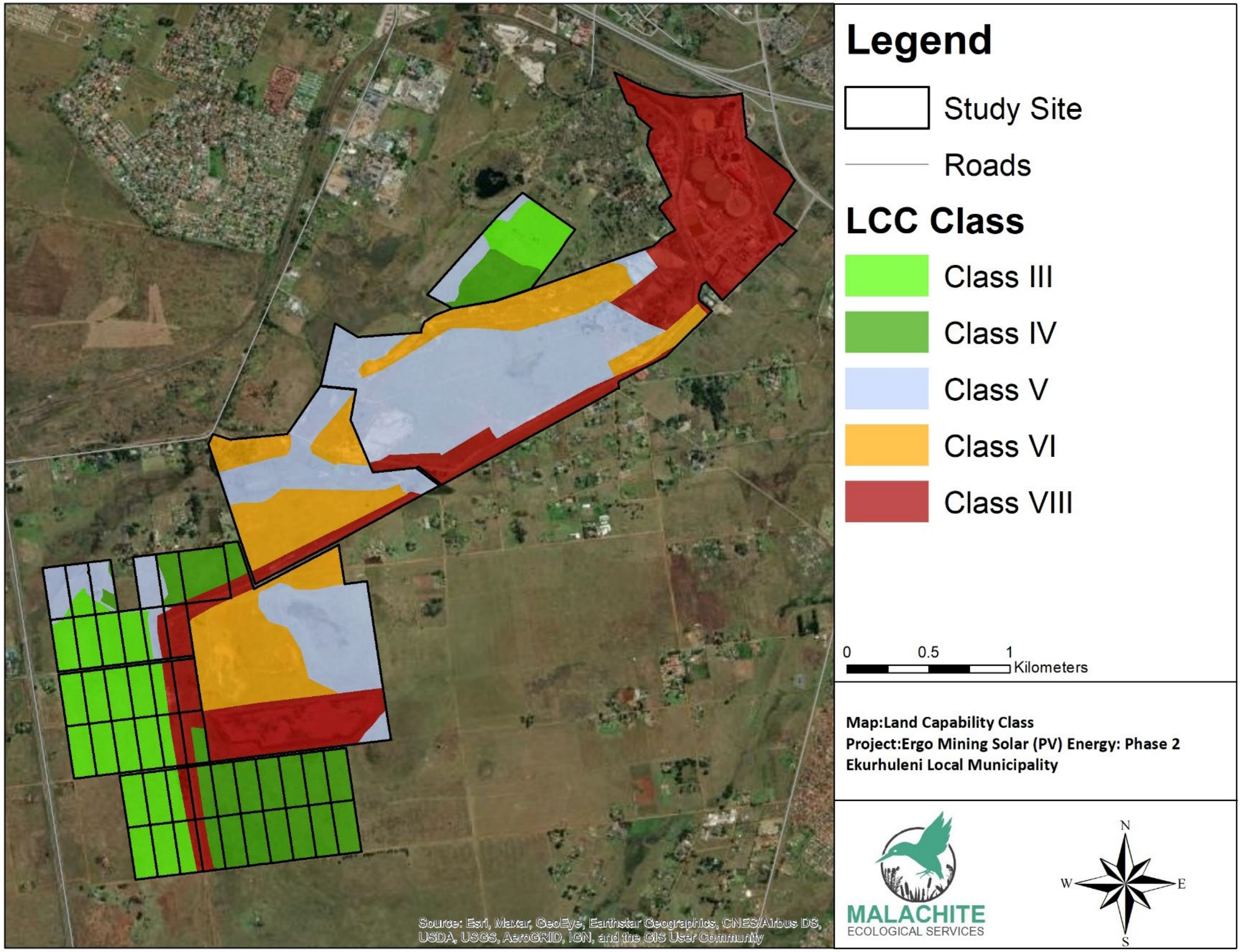

Figure 16: Land Capability Classes which guide the Agricultural Land Potential of the site

6. CONCLUSION AND RECOMMENDATIONS

A combination of Land Type data and the information gathered from phase 1 of the Ergo Gold PV project was utilised to determine the soils, land capability and agricultural potential of the study site. Utilising this data, the study site was categorised into two separate soil types, the Natural Soils and the Anthrosols and Technosols.

The natural soils were classified as the Mispah, Glenrosa, Hutton, Nkonkoni and Katspruit soil forms. The Anthrosols and Technosols were classified as the Grabouw, Witbank, Stilfontein and Johannesburg soils forms.

Utilising the soil information, climatic information, and topography, the study site was assessed in terms of the agricultural and land capability potential. The study site has been categorised into the Class III, Class IV, Class V, Class VI, and Class VIII categories. The Class III and Class IV category is classified in areas that contain the natural Mispah/Glenrosa and Hutton/Nkonkoni soils. Class III areas occupy 14.4% of the study site, while Class IV areas occupy 12.39% of the site. The Class V category is reserved for saturated soils and was thus mapped where the Stilfontein and Katspruit soils were identified or are likely to be identified. Class V areas occupy 29.1% of the site. The Grabouw or Physically Disturbed Anthrosol soils have been classified as Class VI areas. Class VI areas have severe restrictions to cropping and are therefore excluded from production under perennial vegetation. Class VI soils occupy 17.9% of the study site. The remaining Johannesburg and Witbank soils are categorised as Class VIII soils. These soils have been completely modified and are not productive for any agricultural activities. Current infrastructure is situated within these areas. The Class VIII areas occupy 26.3% of the study site.

Overall, the study site can be considered to have a low agricultural potential with severe limitations to crop cultivation. The majority of the site is classified as Class V, Class VI, or Class VIII (73.3%). This is as a result of a combination of factors including the significant long term anthropogenic modifications to the soils of the entire study site, the presence of saturated horizons, and the use of the surrounding landscape for mining and urban activities.

Plan of Study for the Impact Assessment

The impact assessment report will include a detailed field investigation of the project area. The field investigation will include taking soil samples using an auger to a depth of 1200mm or to refusal. At each sample location the soils will be classified, and a description of the physical soil characteristics will be conducted. These characteristics will include:

- Diagnostic soil horizons and their respective sequence.
- Depth of the identified soil horizons.
- Soil field texture.
- Colour.
- Effective rooting depth.
- Surface crusting.
- Depth to saturation (water table), if encountered.

- Terrain morphological units/Landscape position (slope %); and
- Rockiness.

The field data will be utilised to refine the agricultural land capability of the specific study site for the project. This will consider the terrain and soil properties, as well as the climatic, water and vegetation data. The field data will be used to particularly describe areas within the study site where natural soils still remain and are therefore more productive with regards to agricultural activities.

Land use impacts of the proposed development will be evaluated. An impact assessment will be undertaken to determine the significance of impacts to the agricultural land capability of the site for any direct, indirect, and cumulative impact. Significance scoring will be undertaken. This assesses and predicts the significance of environmental impacts through evaluation of the following factors: probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed considering any proposed mitigations. The significance of the impact “without mitigation” is the prime determinant of the nature and degree of the remediation that will be required. Each of the above impact factors will be used to assess each potential impact using ranking scales. Risk assessments and various management options will be recommended.

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8. APPENDICES

8.1. APPENDIX A – Agricultural Potential and Land Capability Classes

All factors regarding the assessment of the agricultural potential and land capability of the site were undertaken including an assessment of the:

- Topography
- Climate
- Soil texture
- Soil depth
- Subsoil permeability
- Rockiness and Surface Crusting

Using the information gathered at the site as well as during the literature review, a soil form map was produced. Information was also gathered from the Land type information. This information was utilised in conjunction with the soil data recorded on site (i.e. soil form, depth, permeability, wetness) to produce the Land Capability Map.

8.2. Land Capability Classes – Flow Sheet

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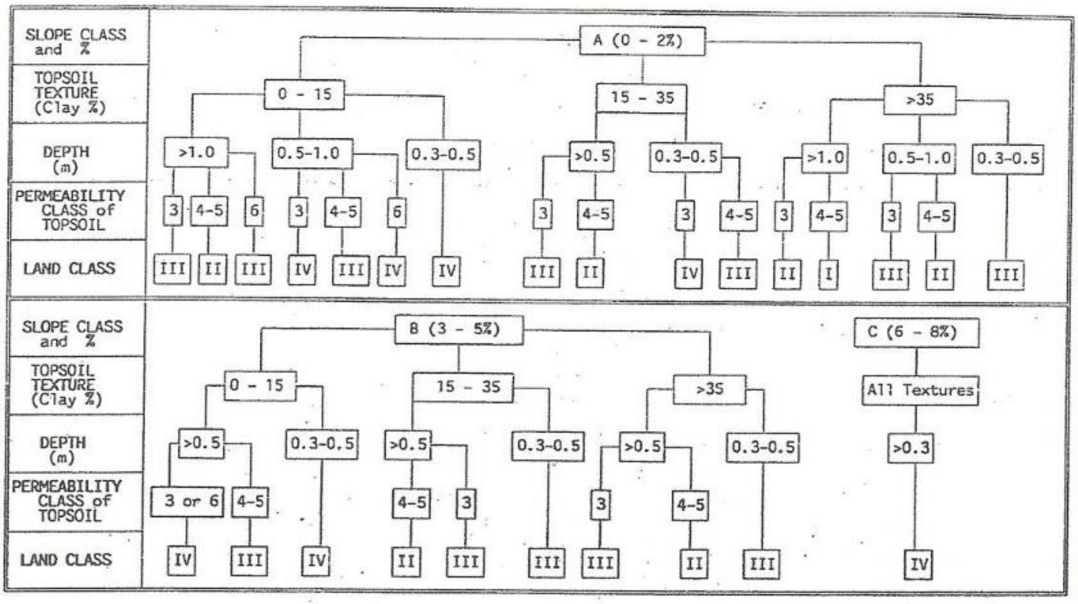
CAPABILITY CLASS DETERMINATION GUIDELINE for BRGs:
Dry Zululand Thornveld (20), Valley Bushveld (21), Lowveld (22), Sandy Bushveld (23) (Average annual rainfall 587-830 mm)

Use the following flow chart to determine the land capability classes for land to be cropped in the above Bioresource Groups.



PERMEABILITY CLASS DESCRIPTION*			
Class	Rate (seconds)	Description	Texture
7	<1	Extremely rapid	Gravel and Coarse Sand. 0 to 10 % clay.
6	1-3	Rapid	5% to 10% clay.
5	4-8	Good	> 10% clay.
4	9-20	Slightly restricted	
3	21-40	Restricted	Strong structure, grey colours, mottles. > 35% clay.
2	41-60	Severely restricted	Strong structure, weathered rock. > 35% clay.
1	>60	Impermeable	Rock and very strong structure. > 35% clay.

* If roots can penetrate the subsoil, test permeability of upper subsoil.
If roots cannot penetrate the subsoil, test the permeability of the mid-topsoil.
Dark structured clay topsoil (vertic & melanic) with a Class 2 permeability should be assessed in the chart as if it has a Class 3 permeability. If permeability is Class 7, downgrade to Land Class IV.

Now refer to the opposite page to make adjustments for wetness, rockiness, crusting or permeability.

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USE THE FOLLOWING LAND CHARACTERISTICS TO MODIFY THE LAND CLASS OBTAINED OPPOSITE, IF NECESSARY: The land capability class determined using the "flowchart" cannot be upgraded through consideration of wetness, rockiness, surface crusting or permeability classes given below, but it may be downgraded as indicated.

WETNESS		
Class	Definition	Land Class
W0	Well drained - no grey colour with mottling within 1.5 m of the surface. Grey colour without mottling is acceptable.	No change
W1	There is no evidence of wetness within the top 0.5 m. Occasionally wet - grey colours and mottling begin between 0.5 m and 1.5 m from the surface.	Downgrade Class I to Class II, otherwise no change
W2	Temporarily wet during the wet season. No mottling in the top 0.2 m but grey colours and mottling occur between 0.2 m and 0.5 m from the surface. Included are: soils with G horizons (highly gleyed and often clayey) at depths deeper than 0.5 m; soils with an E horizon overlying a B horizon with a strong structure; soils with an E horizon over G horizons where the depth to the G horizon is more than 0.5 m.	Downgrade to Class IV
W3	Periodically wet. Mottling occurs in the top 0.2 m, and includes soils with a heavily gleyed or G horizon at a depth of less than 0.5 m. Found in bottomlands.	Downgrade to Class Va
W4	Semi-permanently / permanently wet at or above soil surface throughout the wet season. Usually an organic topsoil or an undrained vlei. Found in bottomlands.	Downgrade to Class Vb

PERMEABILITY	
Permeability Class	Adjustment to be made
1 - 2	If in sub-soil, rooting is likely to be limited: Use the permeability of the topsoil in the flow chart. If this is the permeability of the topsoil, then the topsoil is probably a dark structured clay, in which case a permeability Class 3 can be used in the flow chart.
3 - 5	Classify as indicated in the flow chart.
6	Topsoil should have <15% clay - use the flow chart.
7	Downgrade Land Classes I to III to Land Class IV.

ROCKINESS		
Class	Definition	Land Class
R0	No rockiness	No change
R1	2 - 10% rockiness	Downgrade Classes I to II, otherwise no change
R2	10 - 20% rockiness	Downgrade Classes I to II, otherwise no change
R3	20 - 30% rockiness	Downgrade to Class IV
R4	>30% rockiness	Downgrade Classes I, II, III & IV to Class VI

SOIL SURFACE CRUSTING		
Class	Definition	Land Class
t0	No surface crusting when dry	No change
t1	Slight surface crusting when dry	Downgrade Class I to Class II, otherwise no change
t2	Unfavourable surface crusting when dry	Downgrade Classes I & II to Class III, otherwise no change

NB **Any land not meeting the minimum requirements shown is considered non-arable (Class V, VI, VII or VIII).**
Non-arable land in BRGs 2, 4, 6, 9, 12, 14, 15, 16, 17, 18 & 19 includes:
* all land with W3, W4 or R4,
* all land with slope exceeding 20%,
* land with slope 13-20%, if clay <15% or depth <0.4m,
* land with slope 8-12% and clay >15%, if depth <0.25m,
* land with slope 8-12% and clay <15%, if depth <0.5m, and
* land with slope 0-7%, if depth <0.25m.

20 March 1996

8.3. APPENDIX B – CV of Author

PERSONAL DETAILS

Name	Rowena Harrison
Date of Birth	21 April 1982
Identity Number	8204210320081
Nationality	South African
Current Position	Director (Wetland Specialist and Soil Scientist)
Office Location	Durban, KwaZulu-Natal
Website	www.malachitesa.co.za
Tel	+27 (0)78 023 0532
Email	rowena@malachitesa.co.za

ACADEMIC QUALIFICATIONS

2019 – present	PhD Soil Science (University of Free State and the University of Burgundy, France)
2015	Certificate in Wetland Rehabilitation – University of the Free State
2009	MSc (Soil Science) – University of KwaZulu-Natal
2008	Certificate course in Wetland Delineation, Legislation and Rehabilitation, University of Pretoria
2006	BSc (Environmental Science) – University of KwaZulu-Natal
2005	BSc (Applied Environmental Science) – University of KwaZulu-Natal

PROFESSIONAL AFFILIATIONS

- South African Council for Natural Scientific Professions – SACNASP (Pr. Sci.Nat 400715/15: Soil Science)
- International Association for Impact Assessments – IAIAsa
- South African Wetland Society

CONFERENCES ATTENDED AND PRESENTED

NAME	DATE
Biodiversity Symposium – Presenter on Hydropedology and Carbon Dynamics	November 2019
IAIAsa – KZN Branch – Presenter on wetland offsets from a soil's perspective	October 2019
Zoological Society of Southern Africa Conference	July 2019
Grass Identification Course hosted by African Land-Use Training	March 2019
Groundwater Modelling Course hosted by the Nelson Mandela Metropolitan University	February 2019
Hydropedology Course hosted by TerraSoil Science and the Water Business Academy	November 2018
Wetland National Indaba	October 2018
Wetland National Indaba	October 2017
Wetland Vegetation training course	February 2017
National Biodiversity and Business Network (NBBN). Biodiversity Indaba	March 2017
Certificate course in Wetland Rehabilitation and Management, University of the Free State	March 2015
Gauteng Wetland Forum: Basic Wetland Delineation course	February 2013
EIA Training Course: Real World EIA, Metamorphosis Environmental Consultants	November 2008
Certificate course in Wetland Delineation, Legislation and Rehabilitation, University of Pretoria	May 2008

EMPLOYEMENT RECORD

April 2016 – Present Malachite Ecological Services – Director (Soil Scientist)

- March 2014 - March 2016 Afzelia Environmental Consultants (Pty) Ltd (Soil Scientist and Wetland Specialist)
- September 2012 - February 2014 Strategic Environmental Focus (Pty) Ltd (Junior Wetland Specialist)
- February 2008 - December 2009 Afzelia Environmental Consultants cc (Soil Scientist/Junior Wetlands Specialist and Environmental Assessment Practitioner)

PROJECT EXPERIENCE

Rowena has obtained a MSc. In Soil Science from the University of KwaZulu Natal, Pietermaritzburg. She is professionally affiliated to the South African Council for Natural Scientific Professions (Pr. Sci. Nat) and has 12 years consulting experience in the wetland and soil science field. She has conducted numerous wetland and soil assessments for a variety of development types across South Africa, Swaziland and into West Africa, and has recently added hydropedology assessments to her list of services offered.

She is a member of the International Association for Impact Assessment (IAIA) as well as a founding member of the South African Wetland Society. She is currently a joint PhD candidate at the University of the Free State and the University of Burgundy in France. Her research is focused on the interactions of dissolved organic carbon and hydropedology at a catchment scale.

Below is an abridged list of projects completed:

Soil and Agricultural Assessments

- Mutanda Mine, Kolwezi Province, Democratic Republic of Congo
- Soil and Agricultural Assessment for the cultivation of soil within pivot irrigation systems, Kokstad, KwaZulu-Natal.
- Pedological rehabilitation report for the implementation plan for the restoration of the conservation area within the Dube Tradeport Precint, Ethekwini Metropolitan Municipality.
- Macadamia Orchards, Paddock, KwaZulu-Natal
- Geluk Mine, Limpopo Province
- Madundube Housing Development, KwaZulu-Natal
- Vryheid Substations, Swellendam Local Municipality; Western Cape Province
- Gunther Muhl Agricultural Project; Vryheid; KwaZulu Natal Province
- Sokhulu Agricultural Development Project; KwaZulu Natal Province
- Portion 22 of the Farm Vaalkop Camperdown; KwaZulu-Natal Province

- Vlakfontein Mine, Ogies, Mpumalanga Province
- Silverhill Retreat; Kamberg KwaZulu Natal; KwaZulu Natal Province
- Cleopatra Extension Development; Kamberg; KwaZulu Natal Province
- Bartlett Estate, Hammarsdale KwaZulu Natal Province
- Valley View Estate Residential Development; Camperdown; KwaZulu Natal

Rehabilitation Plans

- De JagersKraal Compensation, wetland rehabilitation plan, KwaZulu-Natal
- Intaba Ridge Housing Estate, Pietermaritzburg, KwaZulu-Natal
- Greytown Bulk Water Supply, Greytown, KwaZulu-Natal
- Hluhluwe iMfolozi Park Bitumen Spill Rehabilitation Plan
- Hollingwood Housing Development, Pietermaritzburg, KwaZulu-Natal
- Samrand Estate; Centurion, Gauteng Province
- Paulpietersburg Shopping Centre; KwaZulu- Natal Province
- L1524 Road Upgrade; KwaZulu- Natal Province
- P187/1 Road Upgrade; KwaZulu- Natal Province
- P254/1 Road Upgrade; KwaZulu- Natal Province
- P483 Road Upgrade; KwaZulu- Natal Province
- N2/R56 Interchange
- Hluhluwe iMfolozi Park Bitumen Spill Rehabilitation Plan

Hydropedology Assessments

- Evergreen Retirement Village - KwaZulu-Natal Province
- Amber Valley Retirement Village - KwaZulu-Natal Province
- Mountain View Abattoir – KwaZulu-Natal Province
- Packo Industrial Site, KwaZulu- Natal Province
- St Joseph’s Housing Development. KwaZulu- Natal Province
- Lions River Housing Development, KwaZulu- Natal Province
- Cato Scrap Industrial Site, KwaZulu- Natal Province
- Somkhele Anthracite Mine, Hydropedological Buffers, KwaZulu- Natal Province

Wetland Impact Assessments

- Wetland and ecological sensitivity of Farm 1287, Mbabane Swaziland
- Ulundi Crossings Shopping Centre, KwaZulu-Natal
- Somkhele Mine, Mtubatuba, KwaZulu-Natal
- Lynton Hall housing development, Pennington KwaZulu-Natal
- Pennington PumpStation – Wetland Monitoring
- Enyathi Water Supply project, Vryheid, KwaZulu-Natal
- Agulhus Vryheid Eskom powerline and Substation, Swellendam, Western Cape
- D1095 road upgrade, KwaZulu-Natal
- Juno-Gromis 230km power line corridor, Northern and Western Cape Provinces