AGRO-ECOSYSTEMS SPECIALIST REPORT:

PROSPECTING RIGHT APPLICATION FOR PHOSPHATE, HEAVY MINERALS, LEUCOXENE, RUTILE, MONAZITE AND ZIRCONIUM ORE ON PORTION 7 (RE), PORTION 11, PORTION 14 AND PORTION 26 OF THE FARM DUYKER EILAND 6, PORTION 1 AND PORTION 3 OF THE FARM SCHUITJIES KLIP 22 IN THE MAGISTERIAL DISTRICT OF MALMESBURY.

Abstract

The agricultural suitability of the Study Area was evaluated using a desktop evaluation, extracting data from the EnviroGIS agricultural classification and evaluation database, as endorsed by the Department of Agriculture. The methodology and the results are presented by this report. The agricultural suitability for cultivated agriculture for the Study Area is marginal (low). The majority area is not suitable for cultivated agriculture. The impact of any other land use activities on the agricultural potential of the land is therefore low.

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Hermann Strydom

Hermann Strydom is the managing director of EnviroGIS Pty Ltd, a multi-disciplinary professional company, founded in 2000. He is furthermore a member of the following professional bodies: PLATO (Geographic Information Systems), SAIF (Forestry), SASSO (Soil Science) and EAPASA (Environmental Impact Assessments South Africa). He has extensive knowledge in spatial land use planning and management systems and has completed more than 200 studies locally and abroad. He furthermore successfully completed and implemented studies ranging from an operational farm level to a national policy level. Studies of significance to this project include the four Limpopo Province Agricultural Hubs and 7 Gauteng Agricultural Hubs developed since 2005. The most recent policy study completed at a National level was the Spatial Zonation of Agricultural Protection Zones (DAFF, 2016). The approach followed and results of this study is highly relevant and significant towards the objectives of this study as it will form the backbone of the PDALB Agricultural Bill. The study furthermore included the development of all major agricultural crops, totalling 44 individual crops, modelled for suitability at both a national and provincial level. His career included senior positions and the CSIR (Forestek and Environmentek) and SAFCOL (GIS Manager) where he was also responsible for the development and implementation of accredited training material for spatial planning and land-use management systems.

SAGC No: PGP 105

Francois Botha

Francois obtained a B.Sc Hons in Soil Science in 1988 at North-West University, Potchefstroom, South Africa and B Comm degree in 2001 from UNISA, South Africa. He has the following experience: Lecturing experience of 13 years in soil science at agricultural colleges. 8 years' experience as an extension officer, with the focus on sugarcane production under irrigation in the Malelane region. Involved in pedological and geological surveys for Forestek (35 000ha's), ARC and private individuals for forestry, game ranching, farming enterprises and new agricultural developments (350 000ha). Functioned as project leader on a number of large scale soil survey projects, e.g. Donkerhoek Agricultural project, Mpumalanga, CoAL Greater Limpopo Coal Land Capability study, 80 000ha USAID Rice project, 55 000ha, Kilombero Tanzania. Pedological specialist studies for environmental impact assessments (EIA's) as well as a number of economic and agronomic feasibility studies for new agricultural developments. Consultation on biological and soil health principles on various agricultural projects. Precision farming sampling and mapping in the maize sugar and industry. Feasibility studies on new sugarcane and agricultural projects under irrigation in Southern Africa. Environmental Impact Assessments for mining and new projects. Rehabilitation of opencast mining soils. Wetland delineation.

SACNASP Registration No: 400063/15

EXECUTIVE SUMMARY

The agricultural suitability of the majority of the Study Area is **low**. Any form of commercial agriculture would only be possible under irrigation. The Study Area is located within the boundaries of the Western Cape Province, West Coast District - and Saldanha Bay Local Municipalities situated between the two coastal towns of *Paternoster* (located west) and *St.Helenabaai* (located east).

Land Cover and -Use:

- Shrubland (fynbos) accounts for 36% of the land cover.
- Cultivated fields (pastures and winter wheat) accounts for 60% of the area.
- Limited infrastructure is present.

Climate:

- The Agro-Climate capability is low to moderate.
- The mean annual rainfall is 194mm.
- The Study Area is located within a winter-rainfall area.
- The mean winter rainfall is 170mm.
- The mean annual temperature is 15.8°C to 16.3°C.
- The rainfall is not sufficient for rainfed cultivation.

Soils:

- The Agro-Soil capability is low to moderate
- Limestone, Sedimentary Rock, and Granite are the dominant Geology formations.
- The soils are highly variable resulting in variable agricultural potential.
- The higher capability soils were derived from the granite parent material (40% of the area).
- The soil depth range is 0 – 120cm
- The topsoil clay % range is 2 – 15%. The subsoil clay % range is 3 – 30%
- Free lime occurs in some of the soils.

Topography:

- The Agro-Terrain capability is low to high. The majority area is moderately arable.
- The topography is undulating.
- The slope gradient range is 1 – 15%.
- The majority of the slopes is less than 12%.

Land Capability:

- The majority of the area (95%) has a land capability class value of less than 7 (class 3 – 6).
- The recommended land use for land capability classes 1 – 5 is conservation.
- The recommended land use for classes 6 – 7 is pastures. Planted or improved pastures would need supplementary irrigation to be cultivated as a commercial crop.

Risk:

- The most significant risk factors are low rainfall, wind and water erosion, compaction, hardsetting, biodiversity.
- The majority of the exploration points are located on land with the higher land capability values.
- 64 of the exploration points (50%) are located on cultivated fields (pastures and winter wheat).
- Areas (the Ab-soil group) has a higher potential for cultivated agriculture. This would however depend on the availability of water for irrigation.
- The underground water supply is 0 – 0.1 litre/second and will not support irrigated agriculture.

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LOCATION

The Study Area:

The Study Area is located within the boundaries of the Western Cape Province, West Coast District - and Saldanha Bay Local Municipalities situated between the two coastal towns of *Paternoster* (located west) and *St.Helenabaai* (located east) (refer Figure 1.). The polygon surface area is calculated at 2,879.7 ha. The main character of the larger landscape is cultivated fields mixed with fynbos (Refer satellite image, Figure 2.). The topography is mainly flat with the *Soetlandskop* landmark located within the boundaries of the Study Area at an altitude of 150 m.a.s.l. Limited infrastructure is present, mainly old diggings and informal housing. Two secondary roads connecting Paternoster and *St.Helenabaai* towns transect the Study Area. Non-perennial rivers and wetlands (seep) are present in the southern portion of the Study Area.

Refer to the following map (scale 1: 250 000) for the location of the Study Area (area in red). Figure 2 shows a satellite image for the Study Area (2022).

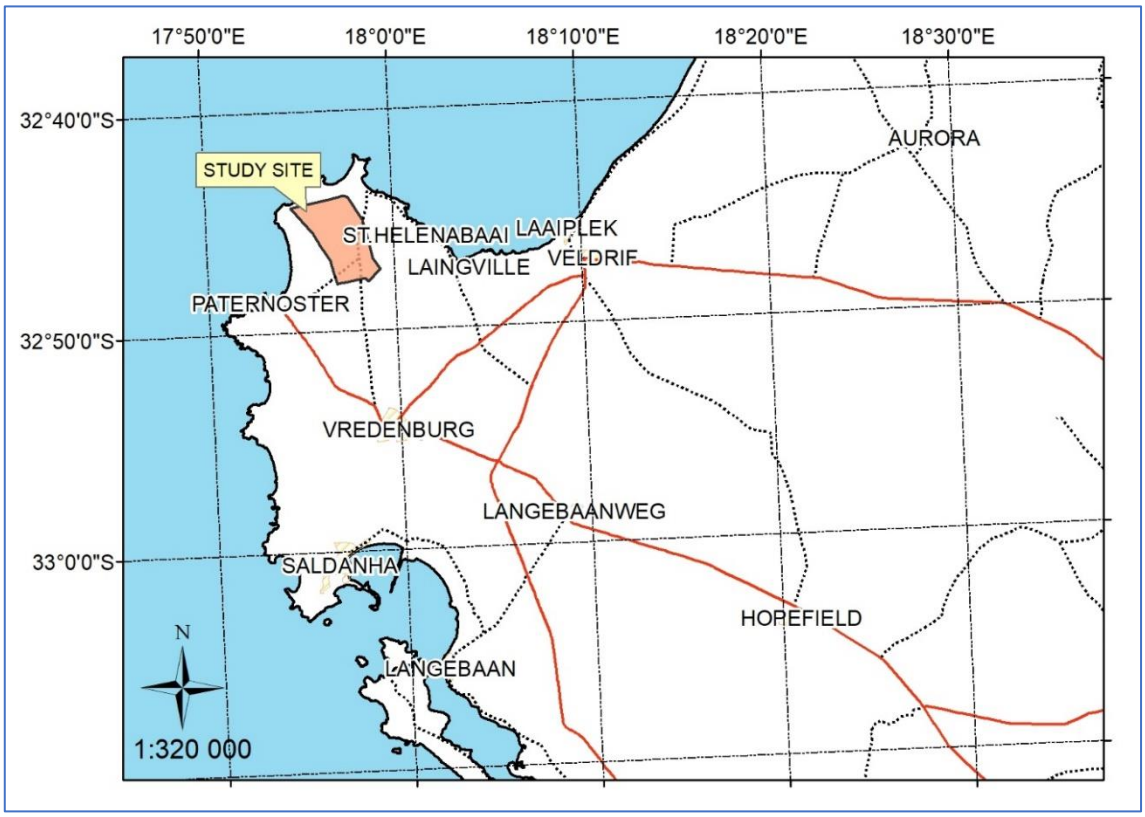


Figure 1: Location of the Study Area.

Figure 2: Satellite image of the Study Area, 2022

LAND COVER AND USE

The land cover and -use of the study area were extracted from the 2020 National Land Cover Database (DEA 2020). The most detailed level of classification consists of 73 classes. For the larger study area, the classes are presented by the Figure below (scale 1:50 000).

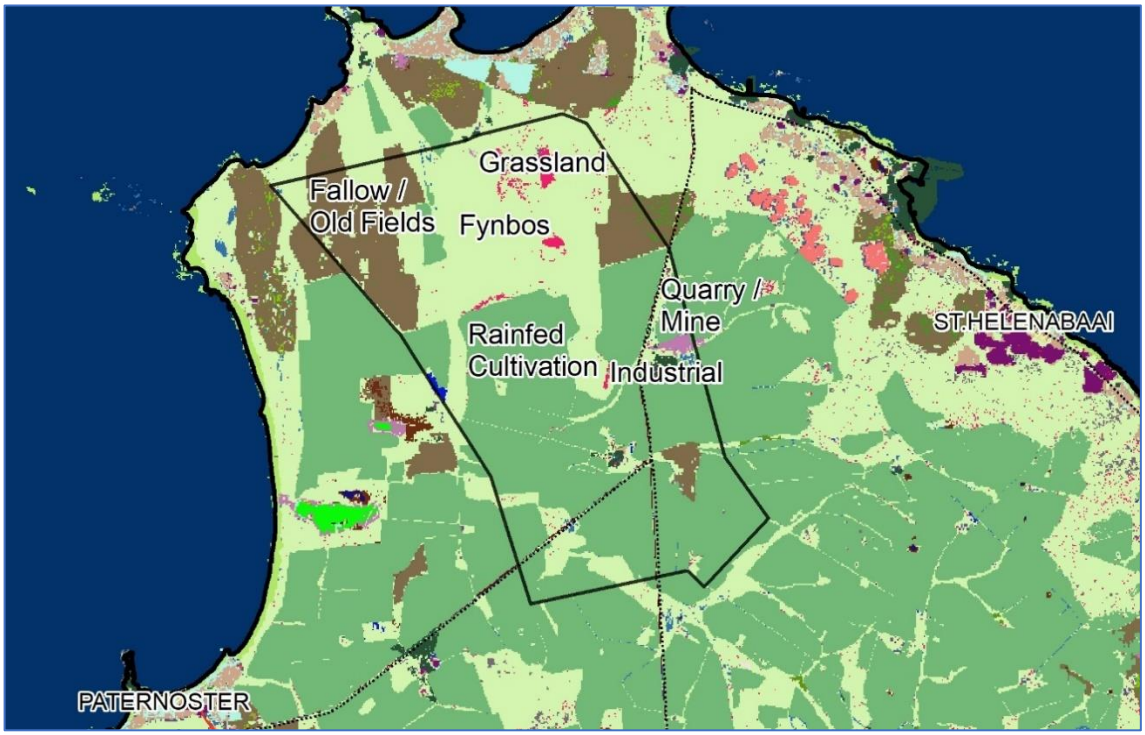


Figure 3: The Study Area land cover and land use map.

The following Table presents the surface areas in hectares and the percentage representation for each of the land cover classes present withing the boundaries of the Study Area.

Class	Name 1	Name 2	Name 3	Area (Ha)	% of Total
3	dense forest & woodland	Forested land	Natural Wooded Land	0.36	0.01
5	contiguous & dense plantation forest	Forested land	Planted Forest	4.40	0.15
9	low shrubland (fynbos)	Shrubland	Karoo & Fynbos Shrubland	1 048.40	36.41
13	natural grassland	Grassland	Natural Grassland	33.88	1.18
19	artificial dams (including canals)	Waterbodies	Artificial Waterbodies	0.04	0.00
25	natural rock surfaces	Barren Land	Consolidated	1.76	0.06
31	other bare	Barren Land	Unconsolidated	10.20	0.35
40	commercial annual crops rain-fed / dryland	Cultivated	Temporary Crops	1 393.24	48.38
44	fallow land & old fields (grass)	Cultivated	Fallow Lands & Old Fields	3.28	0.11
46	fallow land & old fields (low shrub)	Cultivated	Fallow Lands & Old Fields	343.36	11.92
49	residential formal (low veg / grass)	Built-up	Residential	0.96	0.03
53	residential informal (low veg / grass)	Built-up	Residential	0.20	0.01
55	village scattered (bare & low veg/ grass combo)	Built-up	Village	1.80	0.06
56	village dense (bare & low veg / grass combo)	Built-up	Village	0.08	0.00
66	industrial	Built-up	Industrial	16.52	0.57
67	roads & rails (major linear)	Built-up	Transport	10.28	0.36
69	mines: extraction pits, quarries	Mines & Quarries	Extraction Sites	10.96	0.38
			TOTAL:	**2 879.72**	**100.00**

Table 1: Land cover surface areas.

The following Table and Figure list the surface area values for the main land cover classes present at the Study Area.

Land Cover/Use	Area (Ha)	% of Total
Waterbodies	0.04	0.00
Wooded	4.76	0.17
Shrubland	1 048.40	36.41
Grassland	33.88	1.18
Barren	11.96	0.42
Cultivated	1 739.88	60.42
Transformed	40.80	1.42
	2 879.72	**100.00**

Table 2: Main land cover groupings.

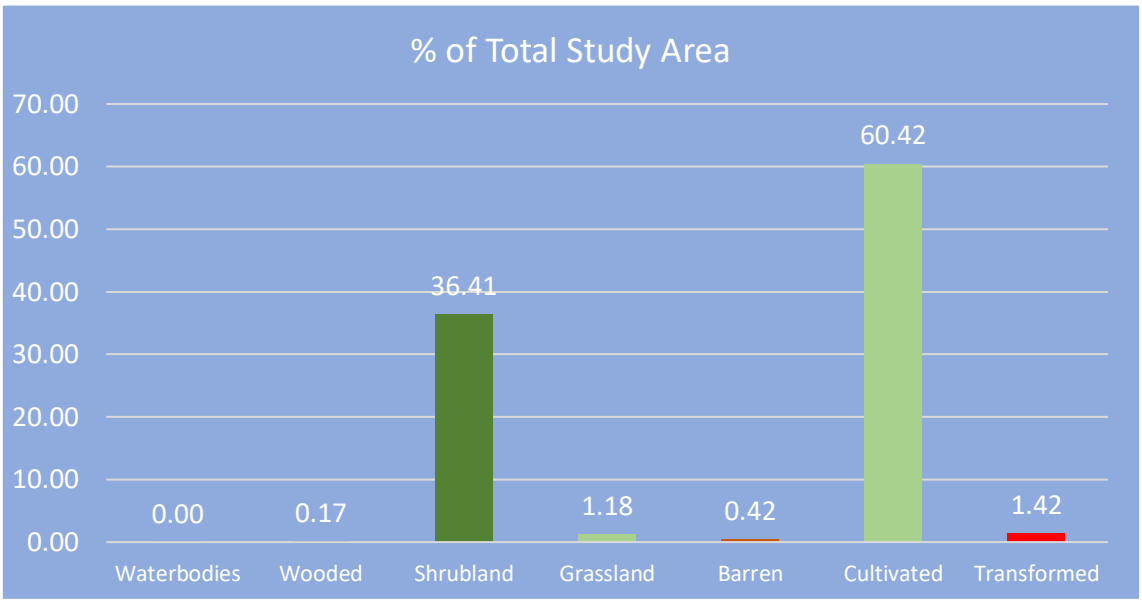


Figure 4: The main land cover class % values.

Interpretation and Discussion:

- Cultivated fields and shrubland (Fynbos) account for approximately 97% of the Study Area land surface area. The remainder is made up of grassland, wooded areas, waterbodies and infrastructure.
- The main vegetation type as classified by the South African National Biodiversity Institute (SANBI, 2006) is Langebaan Dune Strandveld with a conservation status of vulnerable (northern areas). The most south-eastern area is classified as Saldanha Granite Strandveld with a conservation status of endangered. Both areas are part of the Fynbos Biome.

Cultivated Areas:

Cultivated areas refer to all cultivated fields, including planted pastures, old fields, horticulture, and land cultivated annually. The national field boundary datasets (used for national annual yield predictions of grains and other crops) dated 2019/2020 were extracted to determine cultivated agricultural activities within the larger agro-ecosystem and boundaries of the Study Area.

The following Figure (scale 1:250 000) shows the cultivated agricultural activities in green, with pivot irrigation shown as blue concentric circles located east of the Study Area (approximately 50km east).

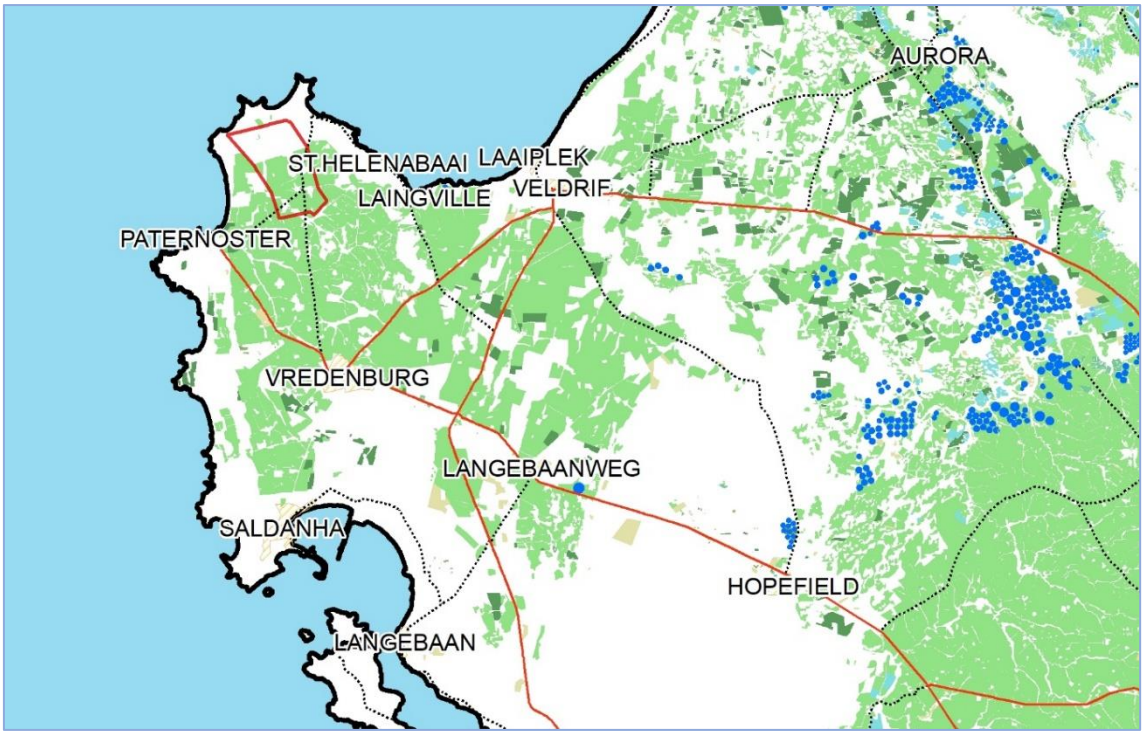


Figure 5: The location of cultivated agricultural activities in the larger Agro-Eco System. Refer green and blue.

Interpretation and Discussion:

- The cultivated areas are classified by the Department of Agriculture Forestry and Fisheries (DAFF, 2022) as 'rainfed annual crop cultivation and/or planted pastures'.
- Winter wheat currently cultivated.
- Other crops cultivated: barley, lucerne and lupines.
- A moderate – high intensity of cultivated agriculture is present within the larger agro-ecosystem.
- The cultivated areas within the Study Area boundaries were utilized for pastures, winter wheat, barley, and lupines. The adjacent image shows an infra-red image of winter-wheat cultivation within the boundaries of the Study Area.

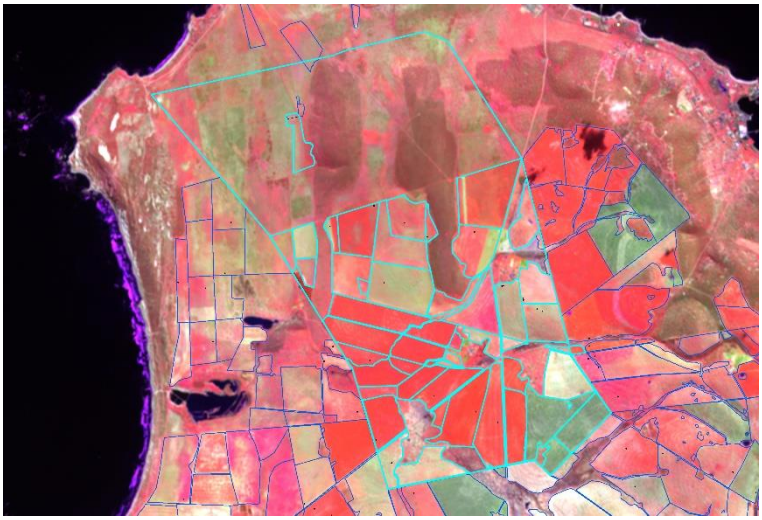


Figure 6: Winter Wheat plantings.

CLIMATE

Rainfall:

Rainfall is an important input variable in determining *agro-climate capability*. It is part of *moisture supply capacity, rainfall variability* and *rainfall concentration* calculations. The *median* annual rainfall of the study area ranges between 230mm in the north to 251mm in the south (a *mean* annual rainfall of 194mm). Approximately 87% of the annual rainfall is concentrated during the winter months (mean of 170mm), April to September with less than 30mm rainfall during the summer months. The following Figure shows the *mean monthly* rainfall values for the Study Area (Schulze, 2007). (Refer to Annexure 1 for climate variable definitions).

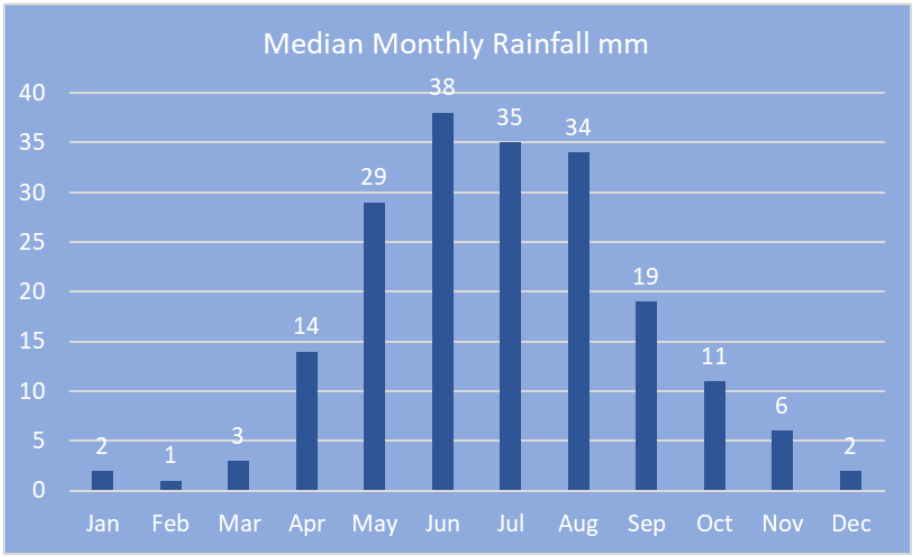


Figure 7: Study Area mean monthly rainfall values.

Temperature:

Temperature is an important input variable in determining agro-climate capability. It is part of the *plant physiological capacity* and *climate risk* calculations. The mean annual temperature of the study area ranges between 15.8°C mm in the north to 16.3 °C in the south. The following Figure shows the mean monthly temperature values for the study area (Schulze, 2007). Refer to Annexure 1 for climate variable definitions.

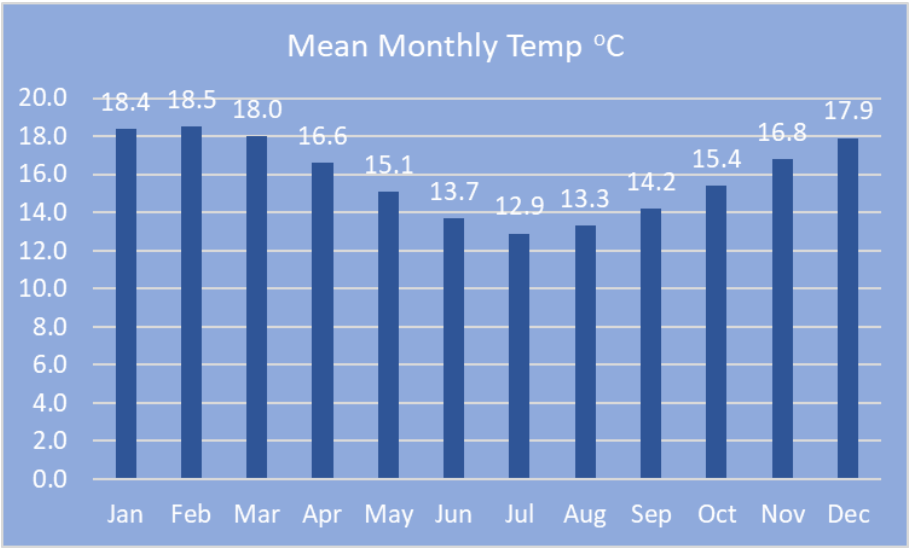


Figure 8: Study Area mean monthly temperature values.

Rainfall and Temperature Interpretation and Discussion:

- The rainfall is not sufficient for rainfed cultivation. The potential mean annual potential evapotranspiration furthermore exceeds the minimum requirement for rainfed cultivation.
- Irrigation and/or supplementary irrigation is a pre-requisite for the cultivation of commercial agricultural crops.
- The temperature conditions are moderately suitable considering the degree-day requirements of most agricultural crops.

Agro-Climate Capability:

Agro-climate capability is a function of the *moisture supply* (balance of rainfall and evaporation), *physiological growth season* (enough sunlight) and various *risk* factors (heat waves, cold spells and frost) that are present within the boundaries of the Study Area.

The following Figure (scale 1:100 000) shows the *agro-climate capability* of the larger agro-ecosystem and the Study Area. The darker the blue, the higher the *agro-climate capability*. Red refers to a lower agro-climate capability. Refer to Annexure 1 for variable definitions.

The agro-climate capability of the Study Area is *low – moderate. (a value of 4 out of a maximum SA value of 9).*

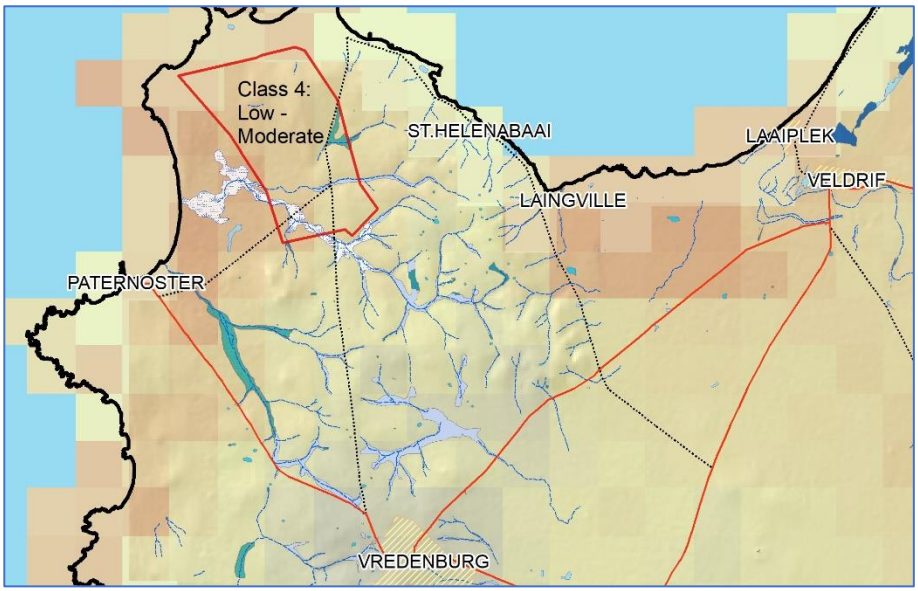


Figure 9: Agro-climate capability map.

Interpretation and Discussion:

- A 9-scale evaluation system is used to rate *agro-climate capability* on a national scale (1 = very low and 9 = very high). The dominant agro-climate capability of the study area is a class 4: low to moderate.
- Considering climate, the conditions at the Study Area is marginal to unsuitable for rainfed agriculture.

Agro-Climate Risk:

Various agro-climate risk factors are included when agro-climate capability is calculated. The following Table provides the values for each of these variables (risk factors) considered:

No.	Variable	Value
1.	Moisture supply capacity	3.Low
2.	Moisture season balance	3.Low
3.	Moisture growing season duration	2.Very Low
4.	Number of 12-week moisture growing periods	2.Very low
5.	Annual balances	4.Low-Moderate
6.	Annual rainfall variability	2.High-Very high
7.	Moisture growing season rainfall variability	8.Low-Very low
8.	Annual rainfall concentration	4.Moderate-High
9.	Moisture growing season rainfall concentration	9.Very low
10.	Physiological capacity	5.Moderate
11.	Number of 12-week temperature periods	5.Moderate
12.	Heat Waves	9.Very low
13.	Cold Spells	9.Very low
14.	Frost Hazard	9.Very low

Table 3: Climate risk values.

How to read the Table values:

The class value (1 – 9) gives an indication of the risk: A low value = a higher risk.

E.g. 1: Moisture supply capacity is “low” therefore a low class value (3) and high risk (red colour);

E.g. 2: Frost hazard is ‘very low’ therefore a high class value (9) and very low risk (blue colour).

Agro-Climate Risk Interpretation:

Very short moisture growing season: Rainfed marginal.
High annual rainfall variability: Drought risk.
Adequate temperature growing season but not optimal.

SOILS

A desktop study of the soils of the Study Area were conducted. The ARC landtype database were refined down to an ecotope level using landtype soils – topographical information combined with the EnviroGIS *EnviroConnekt*™ database of soil-field observations.

Geology:

There is a close relationship between geology (lithology) and soil properties. Geology information were extracted from the EnviroGIS *EnviroConnekt*™ database at a scale of 1:50,000.

Limestone, Sedimentary Rock, and Granite are the dominant Geology formations occurring at the Study Area. The soils were derived from carbonate-, siliciclastic, and rocks and in-situ weathered granite rock.

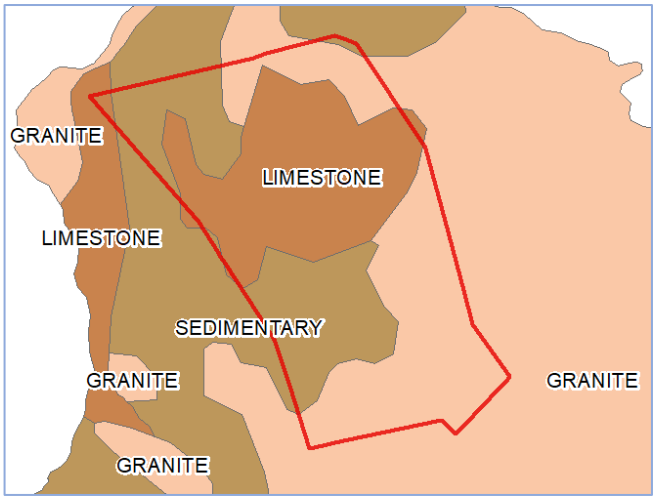


Figure 10: Study Area Geology.

Soil Classification:

The soils of the Study Area were extracted from the EnviroGIS soils ecotope database. An ecotope generally displays a uniform or repetitive pattern of soils combined with topographical properties. The following Figure (scale 1:100 000) and Table present the ecotope information for the Study Area.

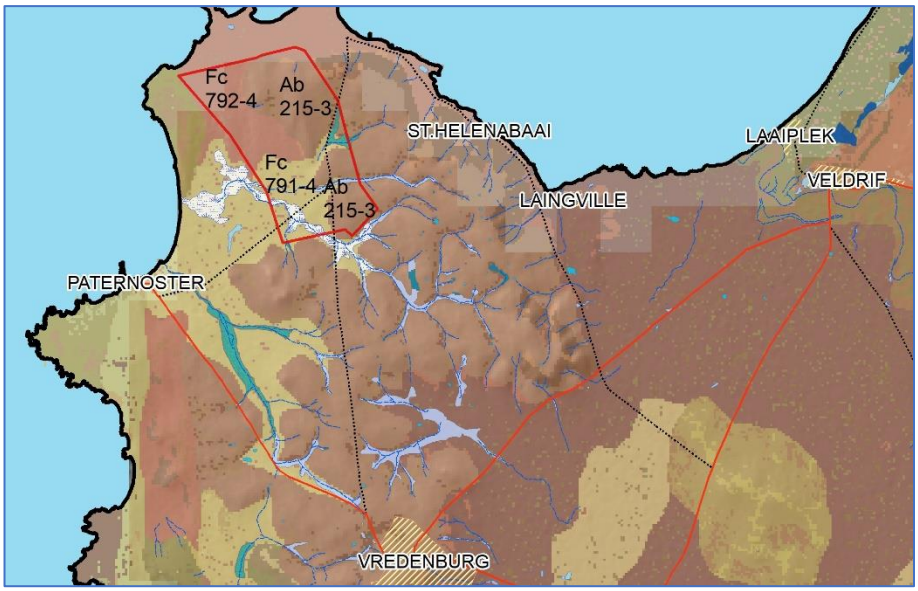


Figure 11: Study Area ecotope map.

Ecotope	Area (Ha)	% Area	Terrain	Soil Forms	Depth (cm)	Clay Topsoil %	Clay Subsoil %
Fc792_4	797.28	27.67	4	Ms.Fw.Kd.Cv.R	0 - 120	2 - 3	3 - 28
Fc792_1	11.18	0.39	1	Ms.Fw	20 - 90	2 - 3	20
Fc792_3	16.34	0.57	3	Ms.Fw.Cv	20 - 120	2 - 3	3 - 20
Fb780_1	1.72	0.06	1	Cv.Ms.Gs.Hu.R.Oa.Cf	0 - 70	8 - 11	4 - 20
Ab215_3	922.85	32.03	3	Hu.Oa.Cv.R.Ms.Wa.Cf.Gs.Vf.Kd.Gc	20 - 90	3 - 15	7 - 30
Ab215_4	184.05	6.39	4	Kd.Oa.Es.Wa.Vf.Ms.Hu	20 - 90	7 - 15	20 - 30
Ab215_1	196.95	6.84	1	Hu.Oa.Ms.Cv.R.Gs.Vf	15 - 90	8 - 15	15 - 25
Ab215_5	26.66	0.93	5	Kd.Du.Vf.Es.Wa.Oa	40 - 120	7 - 15	20 - 25
Fc791_4	680.31	23.61	4	Ms.Es.Fw.Kd.R.Oa.Pn	0 - 120	2 -11	18 - 25
Fc791_5	43.86	1.52	5	Es.Du.Kd.Oa	40 - 90	3 - 15	20 - 30
	2 881.21	100.00					

Table 4: Soil classification data linked to Study Area ecotopes.

Where:

Ecotope:	Unique landtype (soil group) identifier.
Area (Ha):	Surface area in hectares for each of the Study Area ecotopes.
% Area:	Percentage of the area represented by the ecotope.
Terrain:	The dominant terrain position where 1: crest, 3: mid-slope, 4: foot-slope, 5: valley bottom.
Soil Forms:	Dominant soil forms classified according to the SA Binomial System.
Depth (cm):	A total soil depth range derived from the dominant soil forms.
Clay Topsoil %	Topsoil clay% range derived from the dominant soil forms.
Clay Subsoil %	Subsoil clay% range derived from the dominant soil forms.

Fc	Glenrosa and/or Mispah forms dominant. Other soils may occur. Lime occurs regularly in upland and/or valley bottom positions.
Fb	Glenrosa and/or Mispah forms dominant. Other soils may occur. Lime occurs regularly in valley bottom positions.
Ab	Red dystrophic and/or mesotrophic soils. Yellow soils < 10% of area. No water tables, or plinthic catenas.

Table 5: Study Area dominant soil groups.

Soil Depth:

Soil depth is an important variable when considering *agro-soil capability* as it is used in calculating *soil plant available water capacity*, *soil sensitivity* (compaction, erosion, and topsoil hardsetting), and *soil fertility* Refer to Annexure 1 for variable definitions.

Weighted total soil depth values were calculated for each uniform ecotope based on 15 dominant soil form and series values. The total soil depth of the study area ranges between 0 and 120 cm. The following Figure (scale 1:100 000) shows the soil depth map of the Study Area. The shallower soils are coloured in red and the deeper soils in green (map legend in mm).

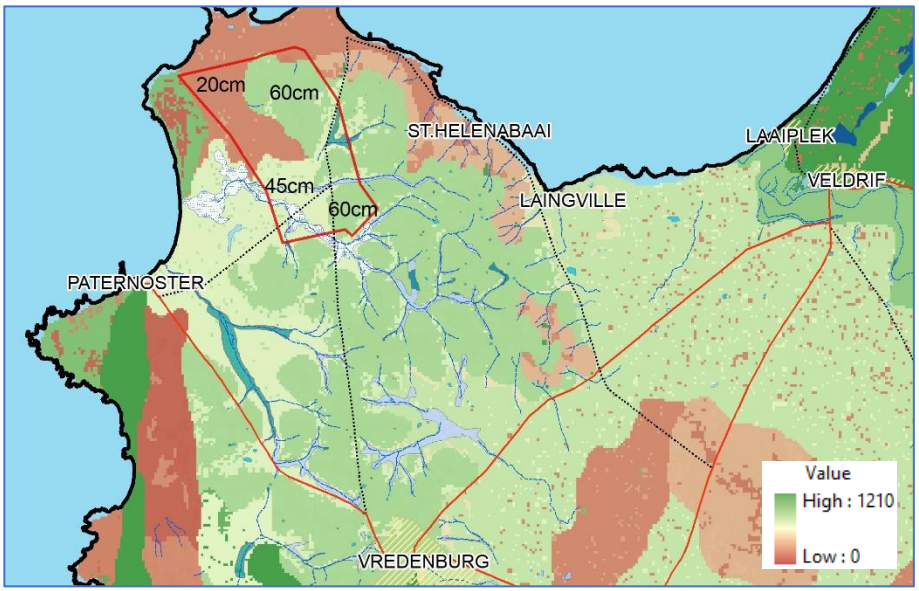


Figure 12: Study Area soil depth map.

Soil Clay %:

Soil clay % is an important variable when considering *agro-soil capability* as it is used in calculating *soil plant available water capacity*, *soil sensitivity* (compaction, erosion, and topsoil hardsetting), and *soil fertility.* Refer to Annexure 1 for variable definitions.

Weighted clay % values were calculated for each uniform ecotope based on 15 dominant soil form and series values. The clay % of both the top- and sub-soil of the study area are variable. The topsoil clay % range between 3 and 12% and the subsoil between 8 and 24%. The higher clay % values are shown in green, the lower values in red. The following Figures (scale 1:80 000) show the topsoil and subsoil clay% maps for the Study Area.

Topsoil Clay %

Subsoil Clay%

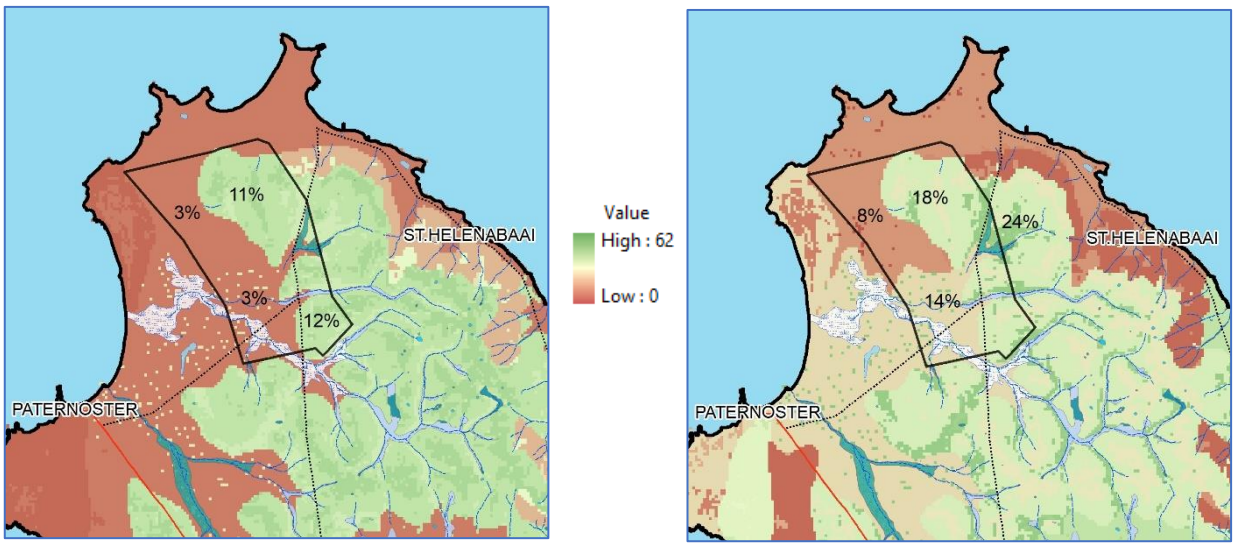


Figure 13: Study Area topsoil and subsoil clay % maps.

Interpretation and Discussion:

Ecotopes:

The soils of the Study Area are highly variable resulting in variable agricultural potential.

The *Fc soil group* is characterised by shallow, sandy *Mispah* soil forms and deep sandy *Fernwood* forms. The soil moisture holding capacity of these soils are severely limited and of ***low*** agricultural value.

The area represented by the *Fb soil group* is insignificantly small (0.06%). The properties are similar to the *Fc soil group* and of ***low*** agricultural value.

The *Ab soil group* is characterised by moderately deep to deep *Hutton* and *Oakleaf* soil forms (Binomial Classification). These soils have a moderate soil water holding capacity and are in general ***suitable*** for cultivated agricultural commodities.

Soil Depth:

The total soil depth values are variable and closely correlated to the various lithology formations. Deep sandy soils originated from the sedimentary formations, deposited by water and wind. The sandy loams originated from granite, in-situ weathered, formations. The shallow soils originated from the carbonate rock formations. The siliciclastic soils are variable (noncarbonate composed mainly of silicate minerals). The effective soil depth (plant utilizable depth) is restricted by two factors: carbonate rock and low clay % values (rapid drainage).

Clay %:

As for depth, the clay % (texture) is closely related to the parent material (lithology). Soils derived from the sedimentary material are high in sand (sandy soils), the carbonate-originated soils range from sandy to sandy loams, the granite-derived soils are less variable and mostly classified as sandy-loams and sand-clay loams.

Agro-Soil Capability:

Agro-soil capability is calculated as a function of *soil plant available water capacity*, *soil sensitivity* (compaction, erosion, and topsoil hardsetting), and *soil fertility* (Cation Exchange Capacity (CEC)- the ability of the soil to store nutrients, and pH- the ability of the soil to release nutrients).

The following Figure (scale 1:100 000) shows the *agro-soil capability* for the larger agro-ecosystem. The agro-soil capability map is coloured according to the national scale of values, red = low, green = high (1 = lowest, 9 = highest). Refer to Annexure 1 for variable definitions.

The agro-soil capability (combining all soil quality variable) ranges from ***low*** (sedimentary) to ***moderate*** (granite-derived).

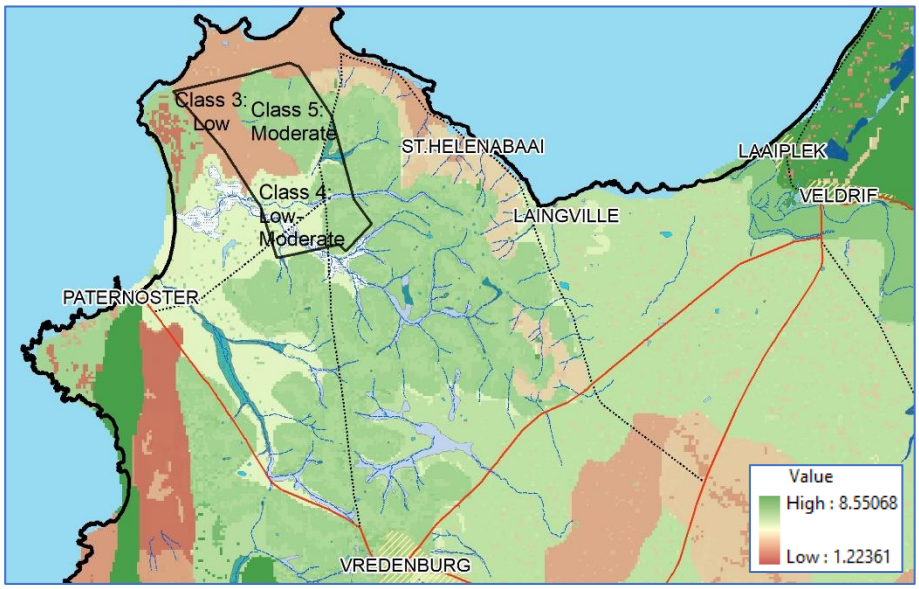


Figure 14: Larger Agro-Ecosystem soil capability map.

Interpretation and Discussion:

- A 9-scale evaluation system is used to rate *agro-soil capability* on a national scale (1 = very low and 9 = very high).
- The *agro-soil capability* of the study area ranges between a class 3 (red areas on the map) and class 5 (green areas on the map). Class 3 equals a low capability and class 5 a moderate capability.
- The majority of the study area has a low to moderate agro-soil capability. The higher capability areas were derived from the granite parent material.
- The *soil-plant available water* in the red areas is very low and in the green areas moderate to high.
- Soil fertility:
    - The ability to store nutrients:
        - Red areas are low and green area are high.
    - The ability to release nutrients:
        - Red areas are moderate and green areas are moderate to high.

Agro-Soil Risk:

Various agro-soil risk factors are included when agro-soil capability is calculated. The following Table provides the values for each of these variables (risk factors) considered:

No.	Variable	Fb, Fc Groups	Ab Group
1.	Soil-plant available water	2.Low-Very low	4.Low-Moderate
2.	Ability to store nutrients	1.Very low	3.Low
3.	Ability to release nutrients	9.Very high	8.High
4.	Wind erosion risk	1.Very high	6.Moderate-Low
5.	Water erosion risk	3.High	5.Moderate
6.	Surface crusting risk	5.Moderate	3.High
7.	Compaction risk	2.High-Very high	2.High-Very high

Table 6: Climate risk values.

How to read the Table values:

The class value (1 – 9) gives an indication of the risk: a low value = a higher risk.

E.g. 1: Ability to store nutrients is “very low” therefore a low class value (1) and high risk (red colour);

E.g. 2: Ability to release nutrients is ‘very high’ therefore a high class value (9) and very low risk (green colour).

Agro-Soil Capability Conclusions:

The soil classification, soil depth, topsoil- and subsoil clay % and soil risk factor data (erosion, compaction, etc.) extracted from the EnviroGIS 1:50 000 classification and evaluation database are confirmed when compared to the data recorded during various field exercises.

The agro-soil capability is variable.

The *Ab soil group* (**46.19%** of the Study Area), considering all agro-soil capability variables and risk, is ***moderately suitable*** to cultivated agriculture

The *Fb and Fs soil groups* (**53.81%**) of the Study Area), considering all agro-soil capability variables and risk, is ***marginally- to unsuitable*** to cultivated agriculture.

The agro-soil capability evaluation is <u>independent</u> of the agro-climate and -topographical capability (excluding rainfall, irrigation, etc.).

Agro-soil-, -climate and -topographical capability is therefore combined to derive at a unified land capability value. Refer later.

TOPOGRAPHY

Slope Gradient:

Slope gradient is an import terrain- and land capability variable that inputs into the following agro-terrain capability calculations: *plant photosynthesis* and *surface moisture flow* and *accumulation*. The following Figure (scale 1:100 000) shows the slope gradient of the study area. Red = steep, green = level. The following Table shows the surface areas in ha for 3 slope classes for the Study Area, presented by the legend adjacent to the graph. (Refer to Annexure 1 for variable definitions.)

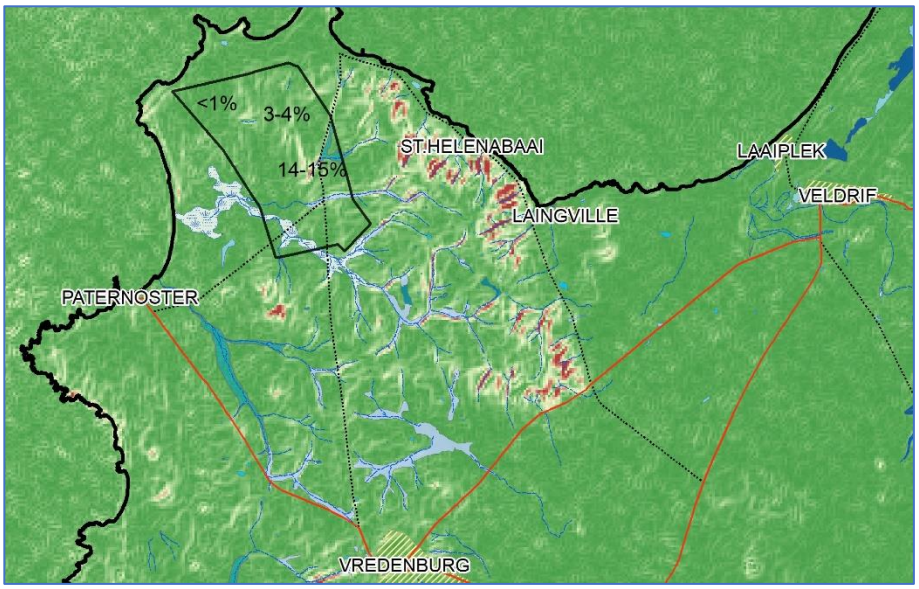
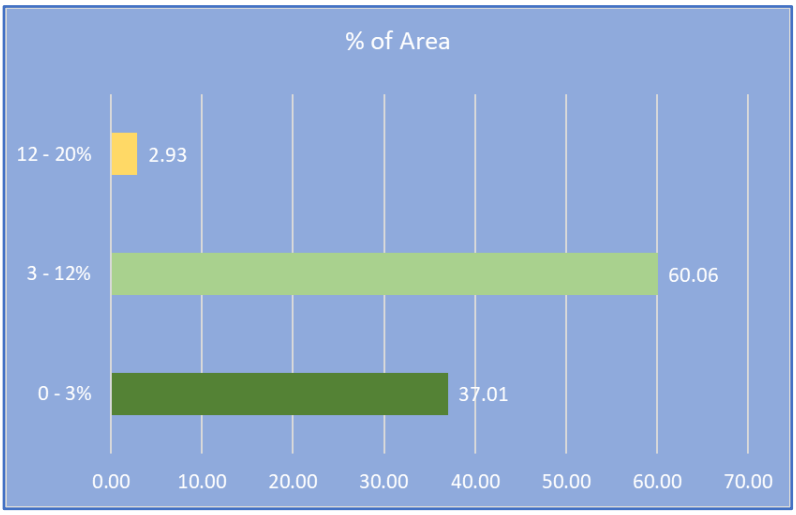


Figure 15: Study Area slope gradient % map.

Class	%	Area (ha)	% of Area
1	0 - 3%	1 066.48	37.01
2	3 - 12%	1 730.45	60.06
3	12 - 20%	84.29	2.93
	Total:	**2 881.21**	**100.00**

Table 7: Study Area slope class values.



Class	
1	0 - 3%
2	3 - 12%
3	12 - 20%
4	20 - 25%
5	25 - 35%
6	35%+

Figure 16: Study Area slope class % values.

Interpretation and Discussion:

The topography of the Study Area can best be described as undulating.

- The topography of the study area is therefore variable, considering slope gradient and aspect.
- More than 60% of the area has slopes between 3 and 12%.
- Approximately 97% of the study area has slopes considered arable (< 12%).
- The steeper slopes seem to be the result of mechanical disturbance in the area.
- The altitude ranges from 24 to 148 m.a.s.l.
- The aspect is highly variable, resulting in variable plant photosynthetic capabilities (solar radiation and degree-days).

Agro-Terrain Capability:

Terrain capability is calculated as a function of *plant physiological capacity* and *terrain sensitivity*. *Plant physiological capacity* is a function of *surface moisture flow and -accumulation* and *plant photosynthesis* (solar radiation as a function of sunlight hours, slope gradient and aspect). *Terrain sensitivity* is a function of *mechanical limitations*, *ground strength*, *erosion risk* and *flooding risk*. (Refer to Annexure 1 for variable definitions).

The following figure (1:100 000) shows the agro-terrain capability map for the Study Area, coloured according to the national scale of values (red = low and green = high).

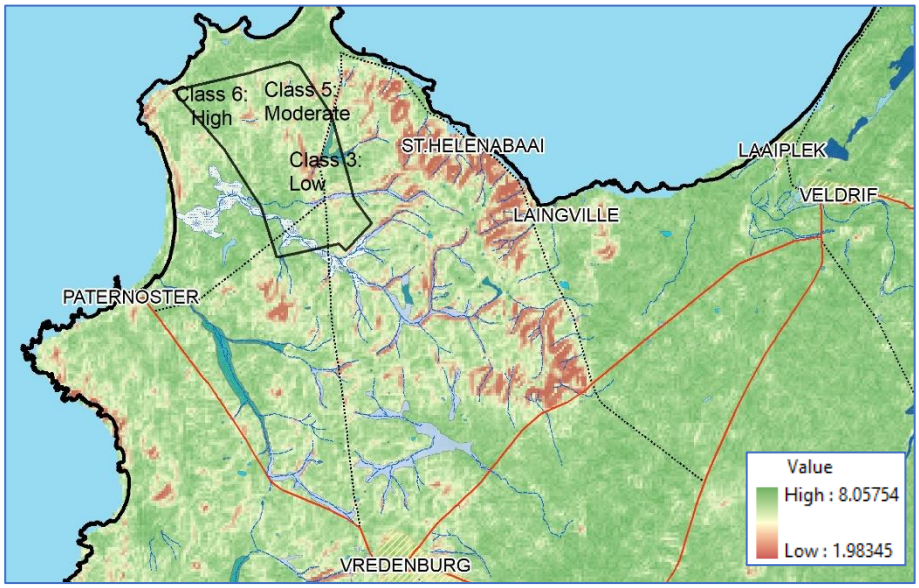


Figure 17: The larger Agro-Ecosystem terrain capability map.

Interpretation and Discussion:

- A 9-scale evaluation system is used to rate *agro-terrain capability* on a national scale (1 = very low and 9 = very high).
- The *agro-terrain capability* of the study area ranges between a class 3 (red areas on the map) and class 6 (green areas on the map). Class 3 equals a low agro-terrain capability and class 6 a high capability.
- The lower capability coincides with the steeper slopes, representing less than 3% of the Study Area.
- The majority of the Study Area is ***moderately arable***, considering agro-terrain capability.

Agro-Terrain Risk:

Various agro-terrain risk factors are included when agro-terrain capability is calculated. The following Table provides the values for each of these variables (risk factors) considered:

No.	Variable	Fb, Fc Groups	Ab Group
1.	Moisture accumulation	5.Moderate	6.Moderate-High
2.	Photosynthetic capacity	5.Moderate	5.Moderate
3.	Mechanical limitations	7.Low	6.Moderate-Low
4.	Ground strength	4.Low-Moderate	6.Moderate-Low
5.	Erosion risk	4.Moderate-High	5.Moderate
6.	Flooding risk	5.Moderate	6.Moderate-Low

Table 8: Climate risk values.

How to read the Table values:

The class value (1 – 9) gives an indication of the risk: a low value = a higher risk.

E.g. 1: Ground strength is “Low-Moderate” therefore a low class value (4) and moderate risk (red colour);

E.g. 2: Erosion risk is ‘Moderate-High’ therefore a low class value (4) and moderate risk (green colour).

LAND CAPABILITY

Refer to Annexure 2 for a detailed definition of land capability. Land capability is a national 15-class agricultural capability rating determined from a combined evaluation of *agro-climate, -soil,* and *-topographical* capability (as presented by the preceding sections). Land capability, combined with crop suitability is an accurate indicator of agricultural suitability. The following Figure (scale 1:250000) shows the land capability map of the Study Area in relation to the larger agro-ecosystem. Green = high land capability and red = low land capability. The land capability for the Study Area range between low – moderate (class 5 – 6). Refer Figure 18.

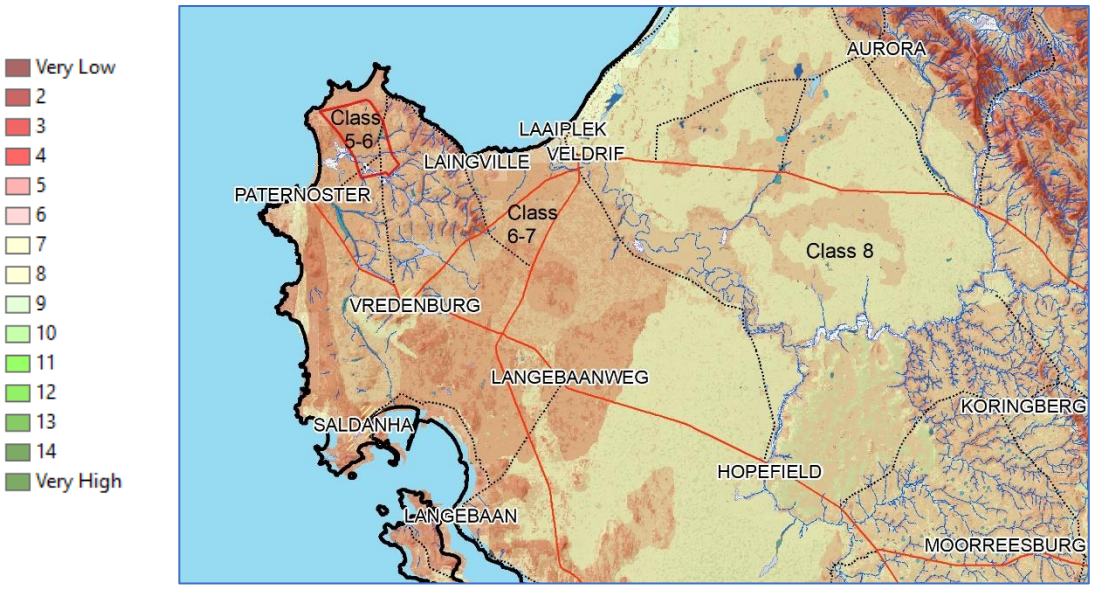


Figure 18: The larger Agro-Ecosystem land capability map.

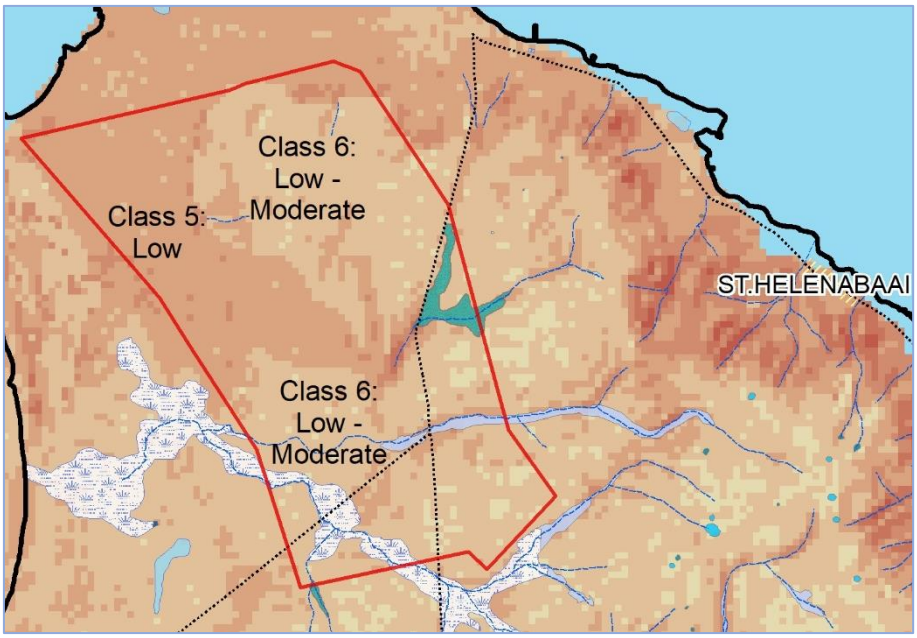


Figure 19: The Study Area land capability map.

The next Figure shows a map of the mapped land capability polygons using the data from Figure 17. The land capability classes show a close relationship with both the soil groups and soil ecotope values. Each polygon has unique agricultural characteristics determining its land capability class value.

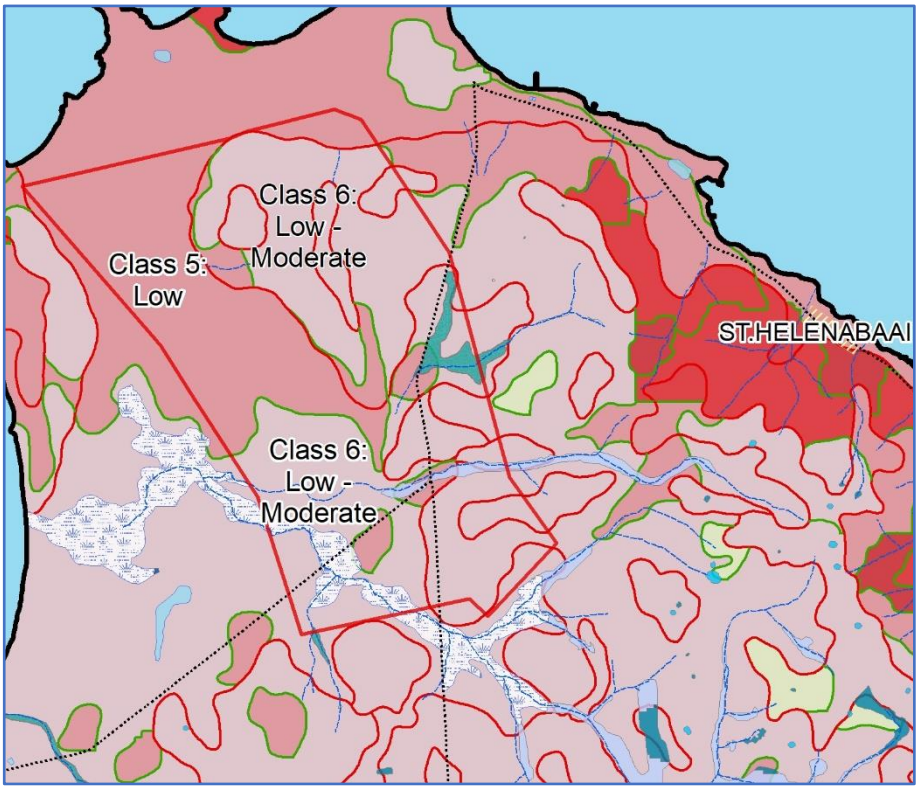
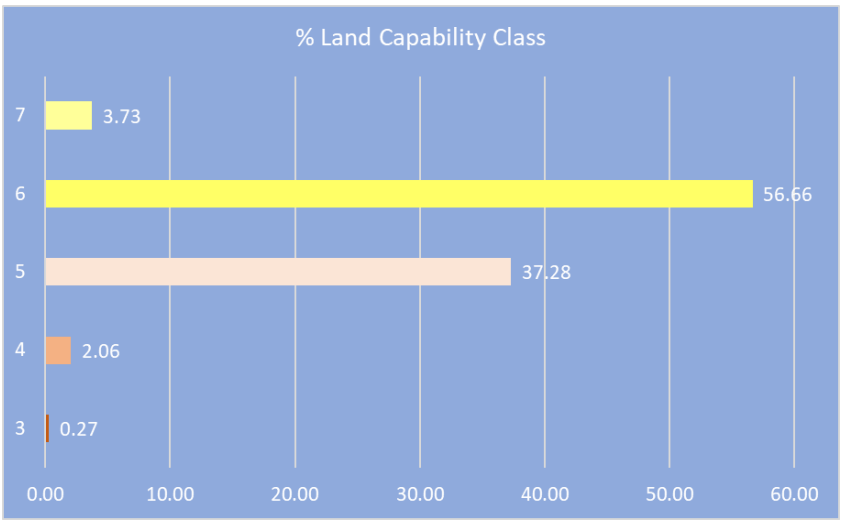


Figure 20: The Study Area land capability polygon map.

Land capability class total surface area in ha and % values were calculated for the Study Area and are presented by the following Figure and Table. The land capability class legend is shown adjacent to the Figure.



Class	
2	Very low
3	Low - Very Low
4	
5	Low
6	Low - Moderate
7	
8	Moderate
9	Moderate - High
10	

Figure 21: Study area land capability class % values.

The following Table lists the land capability classes surface areas in hectares.

3	4	5	6	7
7.74	59.34	1 074.22	1 632.40	107.51

Table 9: Study area land capability class ha values.

Interpretation and Discussion:

The following listing shows the preferred land use options linked to each of the land capability class values:

Classes:	**Commodity:**
1 – 5	Conservation
6 and 7	Natural or improved pastures
8	Planted pastures – irrigated
9 – 11	Rainfed possible. High potential agricultural land
11 – 15	High value crops – rainfed and irrigation

Approximately 60% of the Study Area is suited to natural or improved pastures (winter wheat and barley also cultivated. The remainder of the area is not considered arable and is suitable for conservation.

Exploration Locations:

The geo-location of the 138 exploration points is shown by the following Figure.

The majority of the points are located at the Ab-soil group, with the higher land capability value.

Approximately 50% (64 points) is located on agricultural fields. Refer Figure 21.

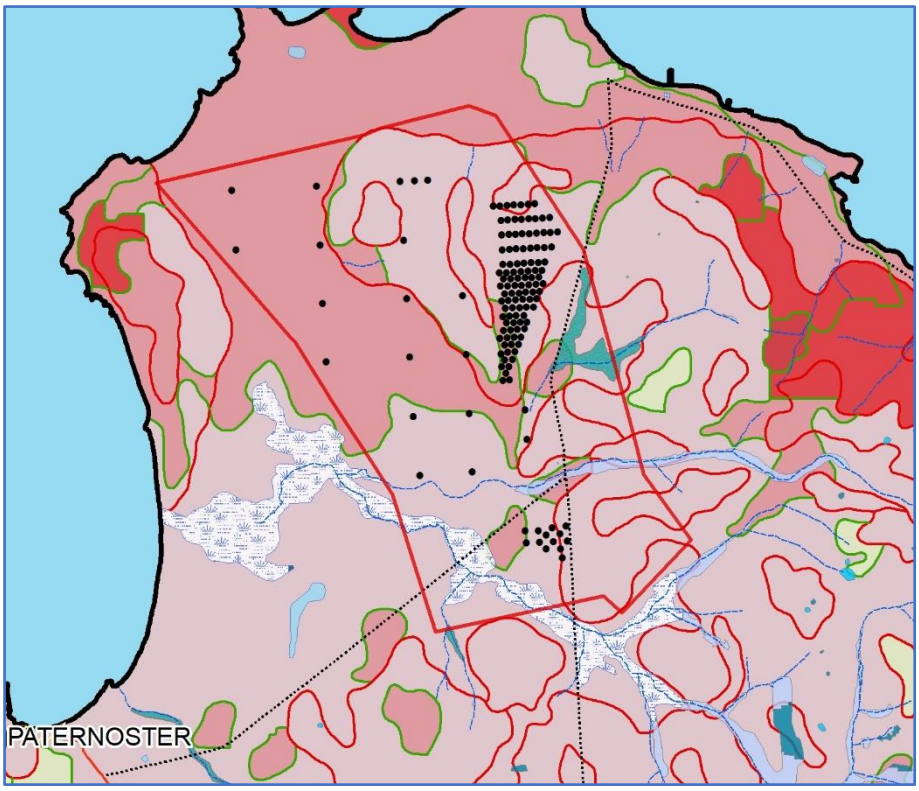


Figure 22: The Study Area land capability in relation to exploration locations.

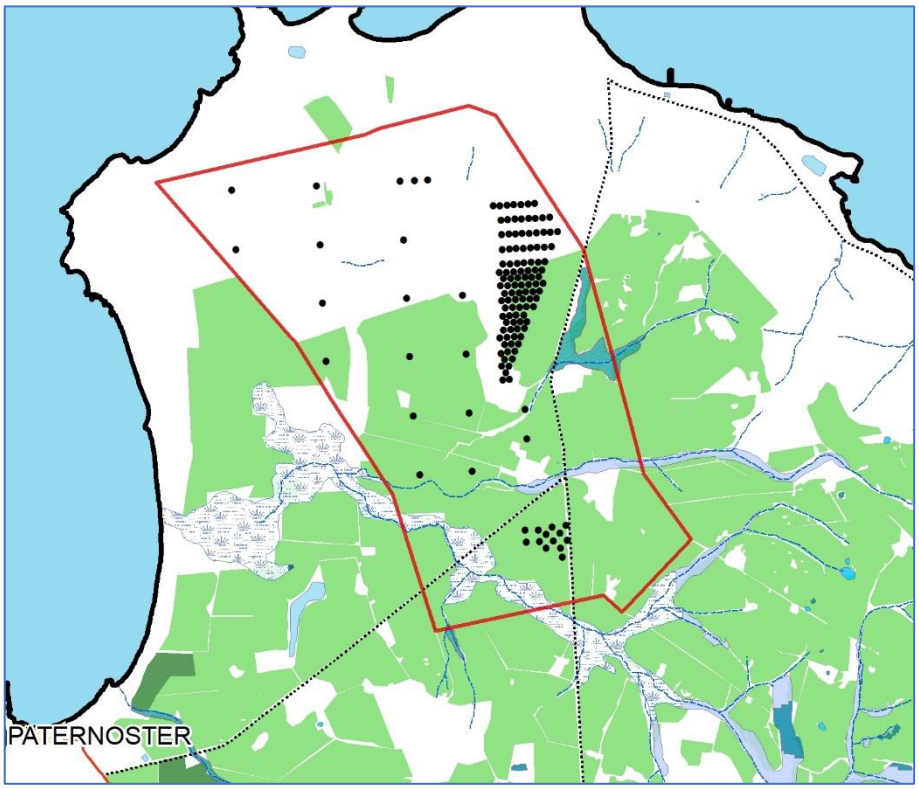


Figure 23: The Study Area cultivated lands in relation to prospecting locations.

HYDROLOGY

Sub-surface hydrology information was extracted from the Department of Water Affairs (DWA) database. Figure 23 shows a map of the location of boreholes at the Study- and larger area. Refer red crosses on the map. One DWA registered borehole is located withing the boundaries of the Study Area:

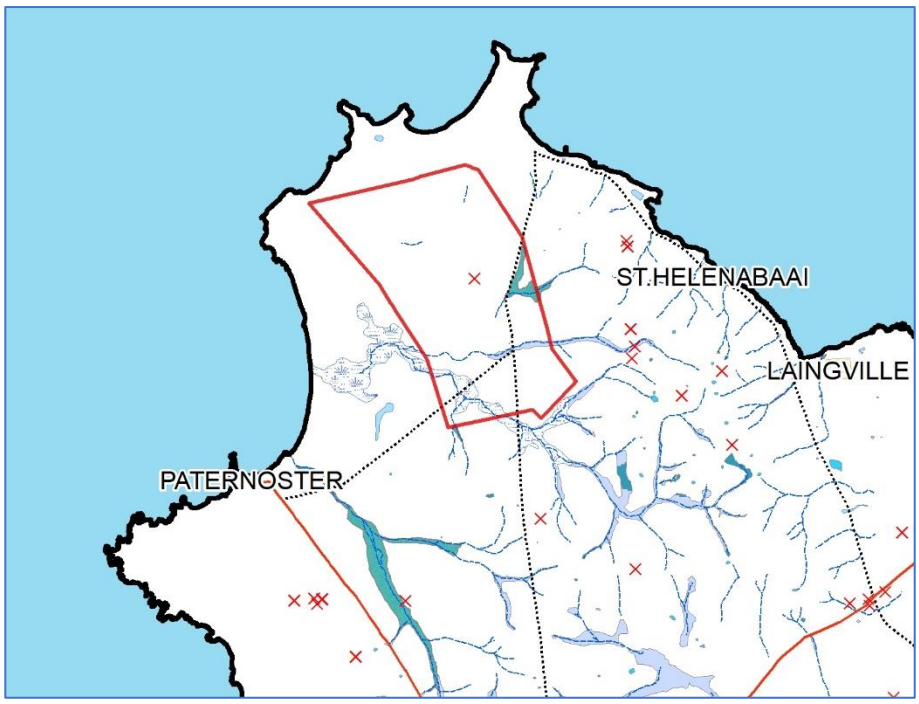


Figure 24: Study Area boundary in relation to borehole locations. Refer red crosses.

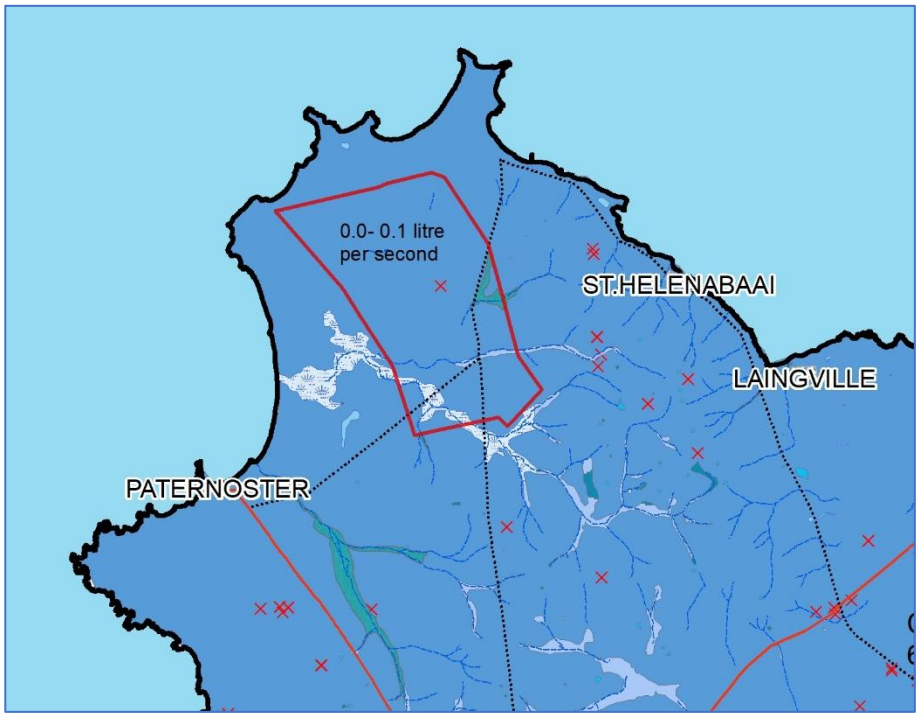


Figure 25: Underground water supply rate.

Figure 24 shows the underground water supply rates. The rate (litre per second) at the Study Area is 0.0 – 0.1 l/s. This figure (0.1 l/s) is significantly lower than the threshold value needed for irrigated agriculture.

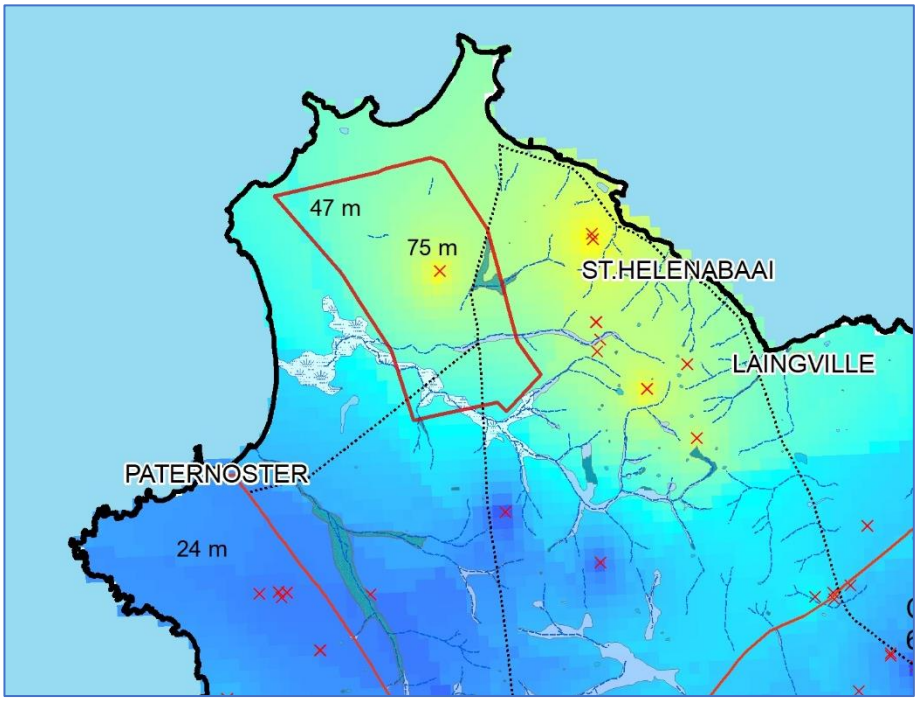


Figure 26: Depth of the underground water supply.

Figure 25 shows a map of the depth of the underground water table. The underground water table depth within the boundaries of the Study Area ranges between 47 and 75 meters.

RISK MITIGATION

Mitigation should be addressed to comply with the requirement of the Conservation of Agricultural Resources Act 43 of 1983 (CARA):

No.	Variable	Mitigation
1	Agricultural fields:	**Moderate:** 64 Exploration points are located within the boundaries of agricultural fields. Approximately 60% of the total study area is cultivated. Main risk to mitigate- fragmentation of fields, top-soil erosion and hardsetting, and soil-compaction.
2	Agricultural land suitability (production capability)	**Low:** The mining impact at the location of the exploration points is moderate and should be mitigated and rehabilitated according to CARA requirements and addressed as part of the EIA EMPr.
3	Agricultural land suitability (low land capability: red areas):	**Low:** The impact on suitability (limited choice of crops) is low. The low land capability should be preserved for conservation. The moderate land capability is suitable for natural pastures.
4	Agricultural ecosystem:	**Moderate:** The impact is moderate (agricultural character of the land) due to the existing land-use fragmentation. Mitigate against permanent land fragmentation.
5	Employment figures	**Low:** Low multiplier effect: Limited permanent job creation opportunities from an agricultural perspective.
6	Biodiversity impacts:	**Moderate – High:** Depends on the ecological specialist study results. The biodiversity of the area is sensitive to endangered and impact from the exploration needs to be mitigated (mitigation to be addressed as part of the EIA EMPr).
7	Economic impact:	**Low.** The area is suitable for low-value crops (rainfed). Conservation and natural pastures. Winter wheat is also cultivated.
8	Agricultural resources:	**Low:** The agricultural resources refer to the natural capital: land cover (grass), hydrology (surface and sub-surface), risk: erosion. Risk (erosion) should be prevented and mitigated as per CARA requirement. The moderate land capability areas (refer greener areas on maps), should be avoided where possible and if not part of the exploration footprint, utilized for agricultural practices. Local community preferences should be considered (social impact).

CONCLUSIONS

- Approximately 60% if the Study Area is: cultivated
- The *agro-climate* capability is: low to moderately suitable
- The *agro-soil* capability is: low to moderately suitable
- The *agro-terrain* capability is: moderately suitable
- The *land capability* is: low to moderately suitable
- Availability of *sub-surface water supply*: very low

The majority of the Study Area land has a **low to moderate suitability** for cultivated agriculture under rainfed conditions. The recommended commodities are planted pastures (under irrigation) or improved natural pastures (rainfed). Winter grains could also be considered. The cultivation of any cash-crops will have to be practiced under supplementary irrigation (winter-wheat, barley, lucerne).

Impact of Exploration Activities:

(Refer to Annexure 1 – Protocol Checklist).

- The extent of the impact of the proposed exploration on:
    - the agricultural resources are *moderate to low*.
    - the agricultural production capability of the site is *low*.
    - existing agricultural activities at the site is *moderate.*
    - fragmentation and disturbance of existing agricultural activities is *moderate*.
    - the agricultural resources, with reference to agro-climate, -soil, -terrain and land capability is *low*. (The agricultural resources (climate, soil and terrain) are marginal to unsuitable for rainfed cultivated agriculture).
    - existing agricultural productivity is *moderate* (64 exploration points located within agricultural fields).
    - The impact on agricultural employment is *low*.
- All agricultural risk (refer report) needs to be mitigated (refer CARA) as part of the EIA EMPr. (impact on soil properties- erosion, compaction. Impact on natural vegetation – rehabilitation). Areas not impacted by exploration activities should be zoned for conservation as the primary land use.

PROFESSIONAL STATEMENT

The Study Area is marginal to unsuitable for rainfed cultivation. The commercial value, from an agricultural perspective is low. The contribution to food security and job creation is low.
The sensitivity considering biodiversity is high.

Note: The impact on the local tourism industry is outside the scope of this study.

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ANNEXURE 1: PROTOCOL CHECK LIST

"Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts in Agricultural Resource" gazetted 20 March 2020, Published in Government Notice No, 230.

Where:

PAR: Paragraph in above-referenced protocol.

PAGES: In this report.

PAR	ITEM	PAGES	COMMENT
2.4	The status quo of the site must be described, including the following aspects which must be considered as a minimum in the baseline description of the agro-ecosystem:		
2.4.1	the soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit and slope;	16-19 22-23	Ecotopes and soil groups with soil forms. Soil depth, top- and sub-soil clay % values. Agro-soil suitability. Agro-soil risk: CEC values, pH, wind erosion-, water erosion-, hardsetting-, compaction hazards.
2.4.2	where applicable, the vegetation composition, available water sources as well as agro-climatic information;	8-11 12-15 14,15 29	Land cover and land use. Cultivated fields. Agro-Climate: rainfall, temperature, evapotranspiration, climate-suitability. Agro-climate risk. Hydrology.
2.4.3	the current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units;	25-27	Land capability. According to the national 15-class scale. Also included – maps of the larger agro-ecosystem. Note: Historical planting data were retrieved from the EnviroGIS crop-frequency database for the past 5-years. Winter Wheat is cultivated in the larger agro-ecosystem. Pastures and winter wheat are the main commodity within the boundaries of the study area.
2.4.4	the current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure; and	-	No employment data for the Study Area.

2.4.5	existing impacts on the site, located on a map (e.g. erosion, alien vegetation, non-agricultural infrastructure, waste, etc.).	31	The assessment was done based on the potential impact on the total study area.
2.5	Assessment of impacts, including the following aspects which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:	14,15 21 24	Impacts assessed for agro-climate, -soils and -topography.
2.5.1	change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure, and broken down into production units;	31, 32	Pastures, winter wheat. No yield figures available. Low intensity agriculture.
2.5.2	change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure; and	31, 32	No information on current employment figures. Low impact on existing agricultural employment figures. Low- intensity agriculture.
2.5.3	any alternative development footprints within the preferred site which would be of "medium" or "low" sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.	25, 26, Fig 16-19.	Refer map of land capability and field boundaries: red areas will have a lower impact than the green areas.
2.6	The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be written up in an Agricultural Agro-Ecosystem Specialist Report.	1 - 46	This report.
2.7	This report must contain the findings of the agro-ecosystem specialist assessment and the following information, as a minimum:		
2.7.1	details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;	40-45	Desktop study. SAGC and SACNASP. Refer page 1 and Annexure 3.
2.7.2	a signed statement of independence by the specialist;	Annexure 3.	Included.
2.7.3	the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	16: soils	No field work for this project. Field work of the area previously conducted by EnviroGIS.
2.7.4	a description of the methodology used to undertake the on-site assessment inclusive of the equipment and models used, as relevant;	12-31, Annexure 2.	For desktop methodology refer pages. EnviroGIS (the author) conducted numerous soil observation in the larger agro-ecosystem. Field work previously conducted.
2.7.5	a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	27 Figures 21,22	Refer to exploration points location map.
2.7.6	an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development;	31	Refer impact and mitigation.
2.7.7	an indication of possible long term benefits that will be generated by the project in relation to the benefits of the agricultural activities on the affected land;		Long-term benefits of the mining operations not provided.

2.7.8	additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc.;	12-31	Refer climate, soil, and topographical risk.
2.7.9	information on the current agricultural activities being undertaken on adjacent land parcels;	8-11 Fig 3, 5	Refer map- larger agro-ecosystem, Land cover and land use.
2.7.10	an identification of any areas to be avoided, including any buffers;	Figure 21.	Refer land capability – green on the map.
2.7.11	a motivation must be provided if there were development footprints identified as per paragraph 2.5.3 above that were identified as having a “medium” or “low” agriculture sensitivity and that were not considered appropriate;	Figures 20, 21, 22	None. Low agricultural impact on the total Study Area.
2.7.12	confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro-siting of the proposed development to minimise fragmentation and disturbance of agricultural activities;	Figure 27,28	The micro-siting of the proposed exploration is not known. The full Study Area has been evaluated.
2.7.13	a substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the acceptability or not of the proposed development and a recommendation on the approval or not of the proposed development;	32	Low intensity agricultural activities. Areas of high suitability are not present. Refer green areas – outside of the Study Area boundaries.
2.7.14	any conditions to which this statement is subjected;	32	Refer mitigation measures proposed.
2.7.15	where identified, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and	31	Refer mitigation measures proposed.
2.7.16	a description of the assumptions made and any uncertainties or gaps in knowledge or data.	31	The impact on biodiversity and underground hydrology part of the Ecosystem Specialist Study. Refer section on underground hydrology.

2.8	The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be incorporated into the Basic Assessment Report or Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which are to be contained in the EMPr.		This report
2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.		Signed.

ANNEXURE 2: DEFINITIONS AND GLOSSARY OF TERMS

Land Capability:

"In the context of this study, is defined as the extent to which land can meet the needs of one or more uses, under define conditions of management without permanent damage. It is the expression of the effect of physical factors (e.g. terrain form and soil), including climate on the total suitability and potential for use for crops that require regular tillage, for grazing, for forestry, and for wildlife without damage. It involves consideration of (i) the risks of damage from erosion and other causes, (ii) the difficulties in land use caused by physical factors, including climate and (iii) the production potential. It does not provide for indications on crop suitability for specific crops, the economic value of the land or the crop." (MTC / AGEN, 1990).

Agricultural Suitability:

"Agricultural suitability is defined as "as the capability of land to cultivate an agricultural crop under various soil, climate, and terrain morphology conditions without improvement of the land through management amelioration practices such as irrigation, soil preparation, and fertilization." (Strydom, 2012).

Agricultural Potential:

"Agricultural potential is what is agriculturally possible on a piece of land and is *"a measure of possible productivity per unit area, per unit time, achieved with specified inputs of management".* Productivity as an indication of the agricultural potential for a given crop under a management level and for an identified portion of land as being dependent on precipitation, temperature, soil conditions, terrain, and crop characteristics" (Schoeman & Scotney, 1987).

Moisture Supply Capacity:

Moisture supply capacity is calculated from the following two calculations: (i) length of the moisture growing season, and (ii) available moisture balance. Available moisture balance is calculated from the difference between the two variables: (i) median annual precipitation and (ii) potential plant reference crop evaporation (Strydom, 2016).

Moisture Growing Season Balance:

Rolling monthly growing season periods with a positive moisture supply balances considering rainfall and evapotranspiration.

Moisture Growing Season Duration:

An average moisture growing season was determined by these authors by adapting a simple water budgeting approach as proposed by the FAO (1978). The moisture growing season was calculated as the difference between the start and the end of the moisture growing season. For a positive balance to occur, a certain amount of precipitation is needed with the evaporation losses not exceeding this threshold value.

Number of three-month Moisture Growing Periods:

Three-month growth periods are considered important to take consideration of the various plant-physiological processes (certain crops can provide a yield within a 3-month growth period).

Annual Moisture Balances:

Moisture supply balances calculated on an annual basis using rainfall and evapotranspiration.

Physiological Capacity:

Heat units were computed for each day for a threshold temperature of 10$_o$C. For purposes of the national study, a threshold 3-month degree-day value of 600 was used to calculate continuous periods meeting or exceeding this threshold value (Strydom, 2016).

Number of three-month Temperature Growing Periods:

The number of start months for a consecutive three-month period where unit units (degree days) meet the crop growth requirements.

Rainfall Variability:

Annual precipitation does not indicate the year-to-year variability in rainfall. The coefficient of rainfall variation (CV) expressed as a percentage was calculated to determine the inter-annual rainfall variability. The higher the CV%, the more variable the year-year rainfall of an area (Strydom, 2016).

Rainfall Concentration:

Refers to the duration of the rainy season, whether the season is concentrated over a short period of the year or spread over a longer period. Standard deviation was used to calculate rainfall concentration for each growth season period. Both annual rainfall and growth season concentration were used to calculate a value for rainfall concentration (Strydom, 2016).

Heat Waves:

A heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity (Schulze, 2007).

Cold Spells:

A cold spell is a weather phenomenon that is distinguished by a cooling of the air. Specifically, a rapid fall in temperature within a 24-hour period requiring substantially increased protection to agriculture. The precise criterion for a cold spell is determined by the rate at which the temperature falls, and the minimum to which it falls (Schulze, 2007).

Frost Risk:

For purposes of the national study, a frost was defined as the occurrence of an air temperature of 0$_o$C or lowered measured at a height of between 1.25 and 2.0 m above soil level, inside an appropriate weather shelter. *Frequency*, *duration* and *occurrence* of frost, were calculated and used as input into the agro-climate temperature risk model (Strydom, 2016).

Ability to Store and Supply Moisture:

Available water capacity or available water content was calculated as the range of available water that can be stored in soil and be available for growing crops, assuming that the water readily available to plants is the difference between water content at field capacity (θ_{fc}) and permanent wilting point (Strydom, 2016).

Soil Fertility Capability:

A combination of the ability of the soil to release nutrients and the ability of the soil to store nutrients.

Ability to Release Nutrients:

The *ability of the soil to release nutrients* was determined from the acidity of the soil. Soil pH values were used to determine acidity. Agricultural soils are prone to becoming increasingly acidic resulting in high concentrations of exchangeable aluminium where alkaline soils are more likely to be dominated by higher levels of sodium, calcium and magnesium (Strydom, 2016).

Ability to Store Nutrients:

The ability of the soil to store nutrients is related to both the amount and type of colloidal material present in the soil. This was measured from calculating the soils cation exchange capacity (CEC).

Soil Wind Erosion Risk:

A wind erosion hazard class was calculated from a table of values as proposed by Schoeman and vd Walt (2001). The variables used included *(i) clay %*, *(ii) sandgrade* and *(iii) particle size* of the topsoil.

Soil Water Erosion Risk:

A water erosion index was calculated based on the Soil Loss Estimation Model for Southern Africa (SLEMSA) approach (Department of Agricultural Technical Services, 1976), as subsequently proposed by Schoeman and vd Walt, *et al*. (2002). The following five variables were used as input into the calculations: *(i) topsoil clay %*, *(ii) soil leaching status* (dystrophic, etc.), *(iii) soil structure* (orthic-, E-, neocutanic horizons), *(iv) top- to subsoil transition* (clear and abrupt) and *(v) total soil depth*.

Compaction:

The extent to which a soil is susceptible to compaction is primarily related to soil texture, organic matter content, depth and, above all, soil moisture content at the time of compaction. The main results of compaction are increased bulk density, increased soil strength, decreased infiltration, decreased available water capacity and lower oxygen diffusion rates (Smith, 1992).

Surface Crusting:

Aggregate instability is a particularly serious problem in soils that have high proportions of sand a silt. As aggregates break open, sand, silt and clay particles are released and washed into the soil pores, preventing further infiltration. This process, known as hardsetting, or soil crusting, effectively seals the soil surface so that instead of infiltrating the soil, rainwater collects in puddles where it is then evaporated. In severe cases run-off is concentrated into small channels that can deepen and consequently lead to serious soil erosion (Asmun and Puri, 2001).

Mechanical Limitations:

For many crop-production operations involving field machinery, the decision regarding whether or not to carry out the operation is largely influenced by the trafficability of the area. An area is considered trafficable if machinery can perform their functions satisfactorily without causing significant damage to the soil. Mechanical limitations, in the context of the national study, was calculated from the two variables: (i) *ground strength* and (i) the *steepness* of the slope (trafficability).

Ground Strength:

The main variables used to calculate ground-strength values were (i) topsoil type, (ii) clay content of the topsoil and (iii) topsoil depth. These variables were calculated from the landtype database according to the ICFR (1993) recommended values.

Topographical Erosion Risk:

The erosive effect of terrain slope gradient was not included in the estimation of soil erosion hazard calculated as part of the soil capability modelling process. The impact of increasing slope gradient on erodibility was therefore calculated as part of the terrain modelling exercise by assessing the runoff and flow acceleration properties of various combinations of terrain from and slope gradient values.

Flooding Risk:

Flooding hazard, as included as part of this study, is dependent on the (i) soil drainage properties and (ii) surface runoff and accumulation of water.

Data Credits:

The following institutions are credited for the supply of data:

1. EnviroGIS Pty Ltd.
2. The National Department of Agriculture, Forestry and Fisheries.
3. The Agricultural Research Council, Institute for Soil, Climate and Water.
4. South African Biodiversity Institute.
5. The Surveyor General.
6. Schulze, 2007.
7. Geo-Terra Image Pty Ltd.

ANNEXURE 3: AUTHORS SIGNED STATEMENT OF INDEPENDENCE

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Agricultural Agro-Ecosystem Specialist Assessment Mareesburg June 2021

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001
Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia
Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	EnviroGIS Pty Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	
Specialist name:	Hermann Strydom			
Specialist Qualifications:	Degree: Soil Science, Data Metrics, Masters: Technology			
Professional affiliation/registration:	SAGC (PGP 0105), SAIF, SASSO, EAPASA			
Physical address:	M188 Boschkop Road. Pretoria East.			
Postal address:	Postnet Suite 213, Private Bag X37, Lynnwood Ridge			
Postal code:	0040	Cell:	0827874289	
Telephone:	012 809 0172	Fax:		
E-mail:	hermann@envirogis.co.za			

2. DECLARATION BY THE SPECIALIST

I, ____Hermann Strydom_____, declare that –

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

Signature of the Specialist

EnviroGIS Pty Ltd

Name of Company:

9 June 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, ___Hermann Strydom_____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

EnviroGIS Pty Ltd

Name of Company

9 June 2022

Date

Gesertifisaat 'n waare afskrif van die oorspronklike
Certified a true copy of the original
Kommissaris van Ede
Ex Officio vir die R.S.A.
Commissioner of Oaths
Ex Officio for the R.S.A.

ROZEL MARGARETHA SCHEEPERS
7209150015089
Chartered Accountant (SA)

Signature of the Commissioner of Oaths

Date

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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Agricultural Agro-Ecosystem Specialist Assessment Mareesburg June 2021

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5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001
Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia
Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

4. SPECIALIST INFORMATION

Specialist Company Name:	EnviroGIS Pty Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	
Specialist name:	Francois Botha			
Specialist Qualifications:	Degrees: Agriculture (BSc Hon). BCom.			
Professional affiliation/registration:	SACNASP (No: 400063/15) SASSO.			
Physical address:	Newmark Office Park			
Postal address:	Postnet Suite 213, Private Bag X37, Lynnwood Ridge			
Postal code:	0040	Cell:	0827874289	
Telephone:	012 809 0172	Fax:		
E-mail:	hermann@envirogis.co.za			

5. DECLARATION BY THE SPECIALIST

I, ____Francois Botha_____, declare that –

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

Signature of the Specialist

EnviroGIS Pty Ltd

Name of Company:

9 June 2022

Date

6. UNDERTAKING UNDER OATH/ AFFIRMATION

I, ___Francois Botha_____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

EnviroGIS Pty Ltd

Name of Company

9 June 2022

Date

Gesertifiseer 'n ware afskrif van die oorspronklike
Certified a true copy of the original
Kommissaris van Ede
Ex Officio vir die R.S.A.
Commissioner of Oaths
Ex Officio for the R.S.A.

Signature of the Commissioner of Oaths

9 June 2022

Date

ROZEL MARGARETHA SCHEEPERS
7209150015089
Chartered Accountant (SA)