

AGRICULTURAL AGRO- ECOSYSTEM REPORT

HOOGELAND DEVELOPMENT:
PROPOSED DEVELOPMENT ON
HOOGEKRAAL AND BUFFELS DRIFT
FARMS-

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**AGRICULTURAL AGRO-ECOSYSEM REPORT:
THE PROPOSED DEVELOPMENT ON HOOGEKRAAL AND BUFFELS DRIFT
FARMS, GEORGE, WESTERN CAPE.**

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1. DECLARATION OF THE SPECIALIST

This agricultural impact assessment has been prepared by Gert Jacobus Malan, a registered SACNASP Soil Scientist (128697). In terms of the National Environmental Management Act (Act No 107 of 1998) (NEMA) and the National Web based Environmental Screening Tool (Agricultural Resources sensitivity, gazetted on 20 March 2020) and Site Sensitivity Verification Report, an Agriculture Impact Assessment is required.

Details of Specialist:

Specialist	Qualification and accreditation
Gert Malan (Pr.Sci.Nat.)	• BSc-Agric Soil Science & Agronomy • MSc Agric – Soil Science • SACNASP Reg. no. 128697/21 (Soil Science)

I, Gert Jacobus Malan, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

- In terms of the general requirement to be independent:
 - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
 - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 of the NEMA EIA Regulations has been appointed to review my work (Note: a declaration by the review specialist must be submitted)
- In terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- I have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any Report, plan or document prepared or to be prepared as part of the application; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations.

Signature of the EAP:_____

Date:_____

2. INTRODUCTION

Environmental authorisation is being sought for a proposed development on the farm Hoogekraal. The site is located on the Maalgateriver and Outeniqua Strand. (Fig. 2.1.) The development will subdivide agricultural land into 87 portions of +5 ha each with some larger portions to the north. These plots will remain zoned for agriculture. The total area of the site is 619 hectares, which is made up mostly by agriculture (+419ha) and veld (disturbed and fynbos) (+200ha)



Figure 2.1. Site Location, near Glentana.

The objective of this study is to identify and assess the potential impacts of the proposed development on agricultural resources and production potential. Mitigation measures, impact management outcomes and monitoring requirements where necessary will be identified.

3. TERMS OF REFERENCE

The terms of reference for this study are to be a specialist report that fulfils the requirements of the *Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources*, gazetted on 20 March 2020 in GN 320.

In terms of the protocol, the level of agricultural assessment required for this site, which is rated by the national web-based environmental screening tool as including land of **very high** sensitivity for impacts on agricultural resources, is an Agricultural Agro-Ecosystem Specialist Assessment. The terms of reference for such an assessment, as stipulated in the protocol, are listed below, and the section number of this report which fulfils each stipulation is given after it in brackets:

The Agricultural Screening Tool classifies the site as having very high agricultural sensitivity. (Fig.3.1)

1. The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professions (SACNASP).
2. The assessment must be undertaken on the preferred site and within the proposed development footprint.
3. The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within the past 5 years, and must identify:
 - a. The extent of the impact of the proposed development on the agricultural resources;
 - b. Whether or not the proposed development will have an unacceptable negative impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.
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:
 - a. The soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit and slope (Section 6.1);
 - b. Where applicable, the vegetation composition, available water sources as well as agro climatic information (Section 6.1-6.5);
 - c. 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 (Section 6.7);
 - d. The current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure (Section 6.8);
 - e. Existing impacts on the site, located on a map where relevant (e.g. erosion, alien vegetation, non-agricultural infrastructure, waste, etc.)

5. Assessment of Impacts, including the following which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:
 - a. 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 (Section 7.1);
 - b. Change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure (Section 7.2);
 - c. 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.

4. METHODOLOGY OF STUDY

This report adheres to the process and content requirements of the gazetted agricultural protocol as outlined in Section 3 above.

The assessment was based on on-site investigation of soils and agricultural conditions and was also informed by existing soil and agricultural potential data for the site. The following existing information was used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Detailed soil survey prepared by B. Schloms & J Lambrechts in 2005.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Climate data was sourced from the SA Atlas of Climatology and Agro hydrology, available on Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

A site investigation was performed by evaluating the current agriculture activities, surface conditions and topography.

Given that the soils were already classified by B. Schloms & J Lambrechts no additional classification was done.

5. ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE OR DATA

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other assumptions, uncertainties or gaps in knowledge or data that affect the findings of this assessment.

6. BASELINE DESCRIPTION OF THE AGRO ECOSYSTEM

Site conditions and soils are shown in Table 6.1, Figure 6.1, Figure 6.3, and Figure 6.4.

6.1. SOILS

Soils of the area have developed mainly from gneissic granite and granodiorite which gave rise to shallow duplex soils. (Table 4.1). These soils are characterized by having a light texture topsoil (3-10% clay) on a heavy textured subsoil layer (35-60% clay). The term Duplex therefore refers to the levelled (Multi story) nature of the profile. Although duplex soils can have substantial depth, this depth is often compromised after rain events, where water builds up on the underlying clay material. A build-up of water in the soil profile is a limiting factor to crop production. Land Types Db1 14 (Full Land Type Memoir in Annex).

Table 6.1. Summarized Land Type Db1 14 soil distribution.

Soil Type	Depth (mm)	Percentage Occurrence	Soil Capability (1-8)	Land Capability Rating (1-15)
Mispah	50-200	2.6	Grazing (Class VII)	4
Estcourt	400-700	51.4	Arable (Class V)	7
Sterkstroom	250-500	12.3	Grazing (Class VI)	5
Kroonstad	500-800	8.7	Arable (Class IV)	8
Swartland	200-500	3.7	Arable (Class IV)	8
Glenrosa	250-600	3.3	Grazing (Class V)	7
Longlands	600-800	2.8	Arable (Class IV)	8
Dundee	>1200	2.4	Arable (Class II)	13
Hutton	600-1200	2.3	Arable (Class I)	14
Wasbank	400-600	2.0	Arable (Class V)	6
Westleigh	500-700	1.6	Arable (Class IV)	8
Lamotte	>1200	1.1	Arable (Class II)	12
Fernwood	>1200	1.1	Arable (Class II)	13

The land Capability classes as described by Scotney *et al.* (1987) gives some insight into the classification of limiting factor with regards to soil. Due to the high erosion risk of duplex soils, most of these duplex soil types will be categorized as IV: Low potential, high erosion hazard. High potential soil forms such as Hutton, Dundee, Lamotte and Fernwood makes up a small amount (4.5%) in this land type.

Table 6.2. Land Capability Classification as per Scotney et al. (1987)

LAND CAPABILITY CLASS	GROUP	DESCRIPTION
CLASS I	Arable	Very high potential; no or few limitations; very low erosion hazard.
CLASS II	Arable	High potential; slight limitations; low erosion hazard.
CLASS III	Arable	Moderate potential; moderate limitations; some erosion hazard.
CLASS IV	Arable	Low potential; severe limitations; high erosion hazard.
CLASS V	Grazing	Not suitable for cultivation; suitable for light grazing; wetness limitations.
CLASS VI	Grazing	Not suitable for cultivation; suitable for perennial vegetation.
CLASS VII	Grazing	Very severe limitations; suitable only for natural vegetation.
CLASS VIII	Wilderness	Extremely severe limitations; not suitable for grazing or afforestation.

A detailed soil survey has been carried out by B Schloms & J Lambrechts in 2005. The suitability of the soils are summarized below.

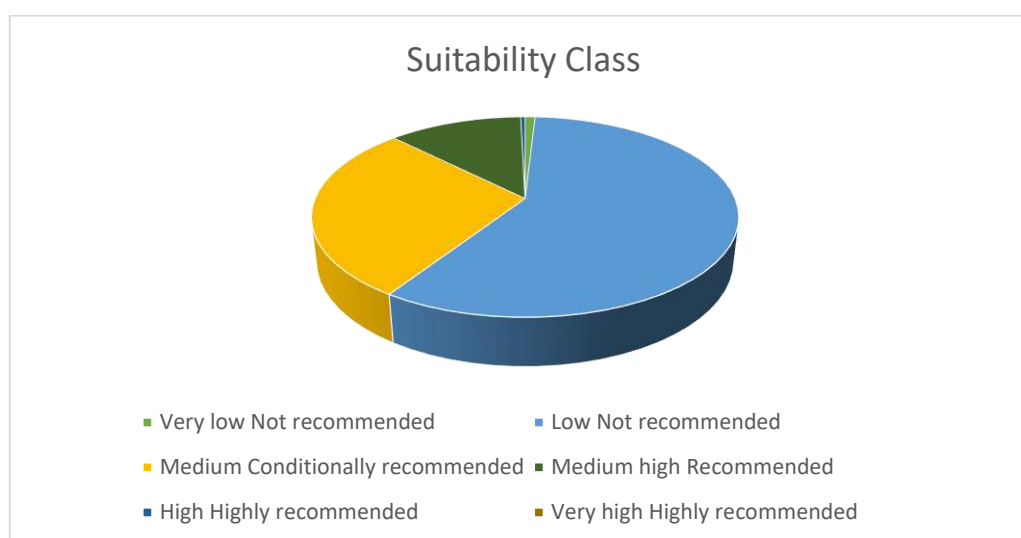


Figure 6.1. Soil Suitability distribution of Hoogekraal Farm.

Table 6.3. Suitability and Activity summarized for Hoogekraal Farm

. Percentage Class (Permanent Crops)	Proposed Agricultural Activity
Not Recommended 59%	Grazing / Planted Pastures / Dryland Bale production. Vegetables(i)
Conditionally Recommended 28.3%	Potential for Permanent crops – Avocado, Macadamia, Wine Grapes
Recommended 12.1%	High Potential for Permanent Crops - Avocado, Macadamia, Wine Grapes
Highly Recommended 0.4%	High Potential for Permanent Crops - Avocado, Macadamia, Wine Grapes

6.2.Terrain and Slope

The site has multiple aspects and slopes, however agriculture is currently only practiced on gentle slopes (<15%). Large portions of the site will remain non agriculture and re-habilitated to natural fynbos vegetation.

6.3.AVAILABLE WATER SOURCES

The property has irrigation rights out of the Maalgateriver, and has been used to fill some of the dams on the property. Total water rights amounts to roughly 100000m3 per annum. In total 13 dams was developed on the property for irrigation and cattle water needs. These dams will stay in place and be used for future agricultural production.

6.4.AGRO-CLIMATIC INFORMATION

The climate of the study area has a Mediterranean climate. The Koppen Geiger classification system categorizes the climate as Cfb (Warm Summer, Dry Winter) or Cfb (Oceanic). The area is not prone to frost or extreme temperature ranges. Rainfall is distributed relatively uniformly throughout the year. Average annual rainfall is 650mm.



Figure 6.2. Climograph of George, Western Cape. (Climate Data.org)

Average, maximum and minimum temperatures are important when considering permanent crop production such as citrus and macadamia nuts. The temperature range between 5.6-26.5°C which makes the area suitable for evergreen crops. Since

evergreen crops does not lose their leaves in the winter, they are susceptible to cold damage in the winter months. The high annual rainfall makes it also ideal for dry land crops where irrigation water is not available.

Table 6.4. Climate Table for George, Western Cape (*Climate Data.org*)

	January	February	March	April	May	June	July	August	September	October	November	December
vg. Temperature °C	21.7 °C	21.7 °C (	20.9 °C	18.4 °C	15.8 °C	13.3 °C	13 °C	15.4 °C	17.9 °C	19.3 °C	20.2 °C	21.4 °C
Min. Temperature °C	17.6 °C	17.6 °C	16.4 °C	13.4 °C	9.3 °C	6.2 °C	5.6 °C	7.9 °C	10.8 °C	13.4 °C	15.3 °C	17 °C
Max. Temperature °C	26.4 °C	26.6 °C	26 °C	23.9 °C	22.6 °C	20.9 °C	20.7 °C	23.1 °C	25.1 °C	25.4 °C	25.7 °C	26.5 °C
Precipitation / Rainfall mm	162	138	113	57	21	10	14	20	36	77	127	159
Humidity(%)	76%	76%	74%	73%	66%	62%	59%	55%	57%	65%	72%	75%
Rainy days (d)	13	12	11	7	3	2	2	3	5	10	12	14
avg. Sun hours	6.5	6.7	7.1	7.0	8.1	8.2	8.0	8.2	7.8	6.8	6.6	6.9

6.5. LANDUSE AND SURROUNDING AREAS

The current land use is grazing for cattle (Fig6.1). Historically planted pastures was established (kikuyu, perdekweek and buffelkweek) for cattle to graze. Alien trees can be found throughout the property and is cut for firewood by local residents (Fig 6.2).



Figure 6.3. Fields used for grazing. View to the South



Figure 6.4 Cutting of alien vegetation for firewood.

The site is bordered by Glentana, a suburb to the south-west. On the northern side the site is bordered by farms whilst the eastern border is on the Maalgateriver.

6.6. AGRICULTURAL POTENTIAL

The soil, landscape and climate combination of the site is suitable for various crop production systems. A summary is provided below:

Grazing / Planted Pastures (**Dryland -59%**):

- Horses (Breeding, Stabling etc.)
- Cattle (Meat)
- Sheep (Meat)
- Game (Breeding) – Only species that are adaptable to supplemental feeding.
- Winter grains for baling (Oats)

Although supplemental feeding might be required for large stock animals, other small holdings might produce and supply neighbouring plots.

Potential for Permanent Crops (**Supplemental Irrigation 40%**)

- Protea and Fynbos cut flower production.
- Wine grape production (Micro winery)
- Blueberry production
- Kiwi (low chill unit requirement)

- Avocado & Macadamia (Subtropical)
- Vegetable gardening (Village + Plots)

With an average annual rainfall of 600mm only supplemental irrigation will be needed in the dryer summer months.

Most vegetable production in the George area is done on shallow duplex soils, which is abundant on this property. This might also be the activity that is mostly practised by land owners for own use.

6.7. AGRICULTURAL PRODUCTIVITY

Current land use is grazing of cattle. The Grazing capacity (2018-Cape Farm Mapper) is 71-80ha/LSU (Large Stock Unit). This puts the possible herd size for the site at 5-6 stock units for the 419ha of agricultural land.

Grazing capacity can be increased with pasture management and supplementary feeding.



Figure 6.5 Grazing Capacity (2018) as per Cape Farm Mapper.

6.8. AGRICULTURAL EMPLOYMENT

Current agricultural employment is linked to the head of cattle grazing the area. Staff moves the cattle between grazing camps and ensures fencing and potable water is available. Seasonal workers are not employed on the property.

Table 6.5. Agricultural Employment.

Farm Name	Permanent Employment
Glentana	2
Brakfontein	2
Hoogekraal	5
Buffelsdrift	3
TOTAL	12

6.9. EXISTING IMPACTS ON THE SITE

There is a number of existing buildings on site. Various parts of the site are infested with alien invasive trees mostly along the borders of the properties (Fig. 6.2).

6.10. SITE SENSITIVITY VERIFICATION

Agricultural sensitivity, as classified by the national web-based screening tool, is directly linked to the capability of the land for agricultural production. The loss of high agricultural capability land will have a larger effect than the same area of low agricultural capability land. The conservation of agricultural land is a national priority since agriculture contributes a large portion to the South African domestic produce and food security. For this reason the gain of productive agriculture land is viewed as a priority as well.

Cultivated land is classified according to the national screening tool as high sensitivity, taking into account the fact that the cultivated land is currently being utilized. This does not take into account the soil, climate and topography. On the other side, uncultivated land is categorized by land capability (DAFF 2017) which takes into account soil, climate and terrain.

Protected agricultural areas are defined in Gazette No. 52009 as "...a national or provincial protected agricultural area, contemplated in Part 4 of Chapter 2, which is a cartographically delineated area of agricultural land— (a) which is preserved for purposes of ensuring that agricultural land is protected against non-agricultural land uses in order to promote long-term agricultural production and food security; and (b) which includes all areas demarcated as such in accordance with section 11"

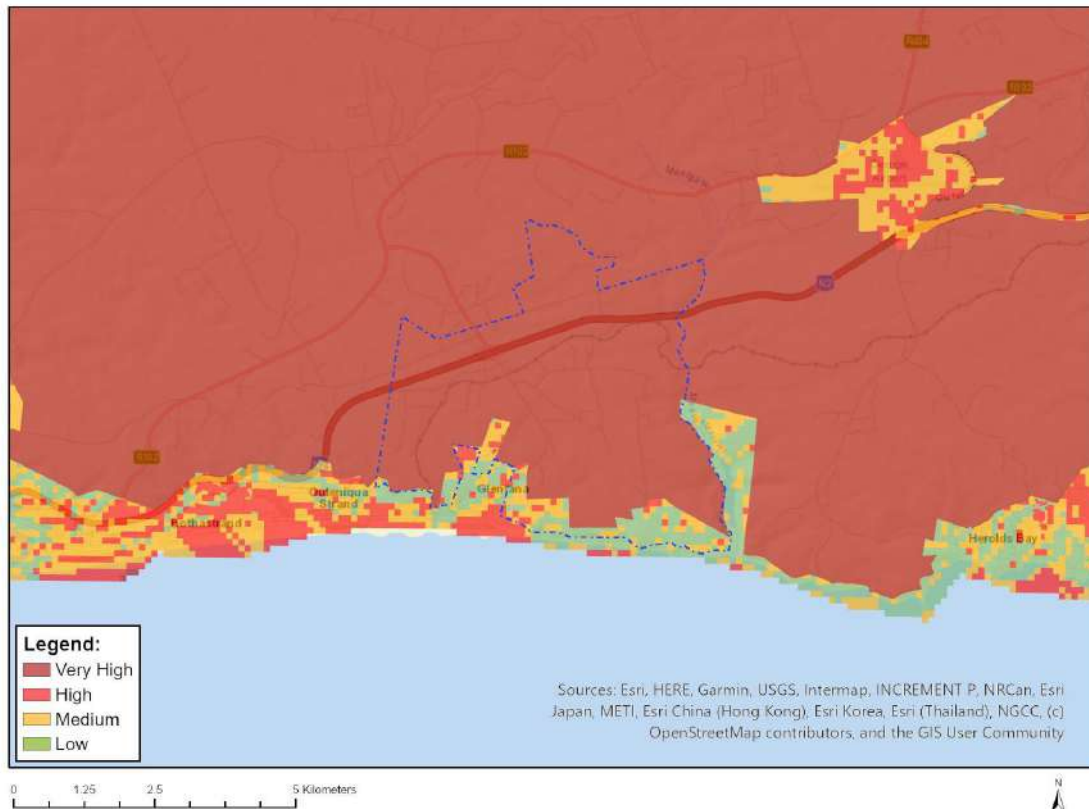


Figure 6.7. Agriculture Themed sensitivity map.

VERY HIGH sensitivity	HIGH sensitivity	MEDIUM sensitivity	LOW sensitivity
X			

Table 6.6: Sensitivity features indicated below:

Sensitivity	Feature(s)
High	Rainfed Annual Crop Cultivation / Planted Pastures
High	Shadenet
High	08. Moderate
High	09. Moderate-High
Low	03. Low-Very low
Low	04. Low-Very low
Low	05. Low
Medium	06. Low-Moderate
Medium	07. Low-Moderate
Very High	Non-pivot Irrigated Annual Crop Cultivation / Planted Pastures
Very High	Pivot Irrigation
Very High	Groot Brak-George PAA

The agricultural sensitivity, as identified by the national screening tool, is Very High. This is due to the Groot Brak George Protected Agricultural Area.

The agricultural sensitivity, as identified by the screening tool, is confirmed by this assessment. The motivation for confirming the sensitivity is that the land of the site, although not the entire property, includes areas of high land capability. Cultivation suitable climate plus cultivation suitable soils gives a high to very high sensitivity. Although only 12% is recommended for permanent crop production, site sensitivity is based on the highest potential within the boundaries of the site.

7. IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The proposed development will subdivide the agricultural land into small agricultural plots. Plot sizes range between 5-57ha per plot, with a average plot size of 7 ha. These plots will be marketed as an agricultural lands within a secure estate. The fynbos plots will be marketed as natural conservation plots.

The key factor in understanding the impact on the agricultural output of the plot is these plots will be marketed as lifestyle farming. Lifestyle agricultural land is appealing for potential buyers for reasons such as recreational opportunities provided by the property and its aesthetic beauty including natural scenery. In the Western Cape more than half of all agricultural land purchases are done for lifestyle reasons (Reed *et.al.* 2009).

Clients purchasing these farming units will in effect purchasing a lifestyle farming unit. Lifestyle buyers mostly rely on income from outside the agricultural sector for their livelihoods and financing of purchased properties, not the commercial agricultural production of the property (Reed *et.al.* 2009). Each 5ha plot will receive roughly 10m³ water per day (300m³/month), for both household and irrigation use. Various productive activities can be done on the property.

Supplemental irrigation for each plot will allow for the following agricultural practises as an example

Table 7.1. An example of water use for various small scale farming activities:

Water Use	Monthly Usage Low (m3)	Monthly Usage High (m3)
Household (Booyesen <i>et.al.</i> (2019)	8.4	16.2
Vegetable garden (500m ²)	45	89
Poultry (10x)	0.06	0.12
Sheep (5x)	0.75	3
Cattle	1.5	3
Game	0.45	3
TOTAL USAGE / MONTH	56.1	114

Detailed calculations can be found in the Annexure.

7.1.CHANGE IN AGRICLTURAL PRODUCTION

Due to the nature of the development, it is not possible to calculate the final agricultural output of the property after development due to the following factors:

- New property owners will decide what kind of agricultural activities will be done on site.
- Financial viability will not be taken into account because lifestyle buyers rely on income from outside the agricultural output of the property (Reed *et.al.* 2009).
- George Riding club will be moving their stables if the development is approved. This will also create a demand for hay bales.

According to STATS SA 26% of agricultural households practise fruit and vegetable production, whilst 39% practises livestock and poultry production. It can be argued

that most of the potential buyers will at least have some sort of vegetable garden and keep some livestock.

7.2. CHANGE IN AGRICULTURAL EMPLOYMENT

Demand for unskilled labour will increase due to the amount of farming units that will have to be managed. In this case the sub division of agricultural land will have a positive impact on employment. Each plot will need some attending to, if it's only for grounds keeping (1 labourer between 3 plots) making for 30 permanent employees between the 90 plots. Vegetables are labour intensive and if 26% (STATSA) of buyers decide to farm with vegetables 1x per plot will add another 23 employees, although this might be seasonal. Livestock uptake is around 39% for agricultural households (STATSA) and will further add 1 employee shared between two plots for 17 permanent employees.

Table 7.2. Employment calculated based of STATSA agricultural household activities.

Activities	Permanent	Seasonal
Horses (George Riding Club)	7	
Agri Plots (90)	30	
Vegetable gardens (26%)		23
Livestock (39%)	17	
Estate Terrain keeping	5	
TOTAL	59	23

7.3. ADDITIONAL ASPECTS OF AGRICULTURAL IMPACT

The gazetted agricultural protocol requires that the following agricultural impact aspects be considered.

7.3.1. DEVELOPMENT BENEFETS VERSUS AGRICULRUAL BENEFITS

The development will permanently remove some agricultural land (10%) for a primary dwelling, access roads and fence lines (Table 7.3). The remainder of the agricultural land will remain in agricultural production. This production might be different than traditional agricultural activities. Small scale niche farming can be practised on a lifestyle farm that would not have been feasible for a commercial farmer. Furthermore the amount of unskilled labour that will be employed to manage 90 Agriculture and 34 Nature Conservation plots will be higher than the current employment. A group housing scheme s also integrated in the development for current labourers and family to move to.

Table 7.3 Loss of agricultural land due to development

Item	m ²	Comment
Average plot size m2	50000	5-7 hectare per plot
Erf size (m2)	2500	Limited to by developer
Road (50mx5m)	555	Distance to centre of 5ha square.
Fencing (2 meters)	1789	Perimeter of 5ha square 2m width.
Available for Agriculture	45461	
Lost Area	9.7%	

7.3.2. ADDITIONAL ENVIRONMENTAL IMPACTS

There are no additional environmental impacts of the proposed development that are relevant to agriculture

7.3.3. NO-GO AREAS

It is not desirable, practical or possible to retain any parts of the site for agricultural production. The Conservation plots are already demarcated and does not fall under the agricultural land for this study.

Therefore, it is not necessary to demarcate any agricultural no-go areas or buffers.

7.3.4. MICROSITING TO MINIMIZE FRAGMENTATION AND DISTURBANCE OF AGRICULTURAL ACTIVITIES

The agricultural protocol requires confirmation that all reasonable measures have been taken through micro-siting to minimize fragmentation and disturbance of agricultural activities. However, for the same reasons that justify the section above, micro-siting of the development infrastructure will have absolutely no effect on agricultural impacts.

7.4. AGRICULTURAL ASSESSMENT

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or potential future agricultural production. If there will be no impact on production, then there is no agricultural impact.

Due to the nature of this development, some portions of the site will be permanently taken out of agricultural production. The aspect of lifestyle farming does bring a different dynamic to the remainder of the agricultural land which difficult to quantify.

The impact is summarised in table 7.4.

7.4.1. CUMULATIVE IMPACT

Cumulative impact refers to the combined effect of a proposed development when added to the incremental impacts of past, present, and reasonably foreseeable future activities within the same environment. It is important to distinguish this from an assessment of all surrounding projects. In this case, the cumulative impact assessment focuses solely on the impacts of this project, viewed in the context of other existing and potential influences. The purpose is to understand this project's contribution to the overall impact, rather than to define the total impact itself.

7.4.2. COMPARATIVE ASSESSMENT OF ALTERNATIVES

No final layout for dwellings can be provided since each owner will decide where the erf will be placed on the 5ha plot. As a result, regardless of their configuration—will have the same agricultural impact: the partial loss of the site's potential for future agricultural use. Therefore, any alternative layouts are identical in terms of agricultural impact.

7.4.3. IMPACTS OF THE NO-GO ALTERNATIVE

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There will be no agricultural impact of the no-go alternative. There is also no real agricultural impact of the development. Because of this, there is no real difference in agricultural impact between the proposed development and the alternative of a no-go for the development.

7.5. MITIGATION MEASURES

There are no measures required to mitigate agricultural impact other than standard good practises during the construction phase that can be summarized as follows:

- **Dust and Erosion Control**
 - Use water spraying to suppress dust during dry periods.
 - Implement erosion control structures (e.g., berms, silt fences).
 - Vegetate exposed areas with indigenous grass mixes to stabilize soil.
 - Evaluate irrigation main line locations before excavations, pressurised pipes can unexpected erosion hazards.
- **Drainage and Runoff Management**
 - Maintain natural drainage patterns.
 - Avoid creating waterlogged zones near orchards. Compacted roads often lead to subsoil drainage complications.
 - Use diversion channels to prevent runoff from construction zones entering productive fields.
- **Compaction Prevention**
 - Restrict heavy machinery movement to designated paths. This will also assist in dust control.
 - Rip compacted areas post-construction to restore soil structure where natural or agricultural areas are to be re-planted.
- **Contamination Prevention**
 - Implement spill response plans for fuel and chemicals.
 - Store hazardous materials away from sensitive agricultural zones.
 - Regularly inspect machinery for leaks.

7.6. PROPOSED IMPACT MANAGEMENT OUTCOMES AND MONITORING

Because the impact is the partial loss of agricultural land use, the remainder of agricultural land should be preserved during construction of the development. This will insure that the only impact is the construction of roads, dwellings, which should leave the remainder of the agricultural land available for production once construction is concluded.

Following above mentioned good practises, no additional outcomes and monitoring is stipulated.

Table 7.4. Table of impact assessment for the impact: Subdivision & Loss of agricultural land.

DESCRIPTION OF IMPACT / RISK	CURRENT LAYOUT	COMMENTS
	1. LOSS OF PORTIONS OF AGRICULTURE LAND 2. SUBDIVISION OF AGRICULTURAL LAND 3. DIVERSIFICATION OF AGRICULTURAL ACTIVITIES	1. +-10% AGRICULTURAL LOSS PER 5HA PLOT. (TABLE 7.3)
NATURE OF IMPACT	1. NEGATIVE 2. NEGATIVE 3. POSITIVE	1. LOSS OF AGRICULTURAL LAND 2. SUBDIVISION OF AGRICULTURAL LAND 3. POSSIBLE INCREASE IN NICHE AGRICULTURE PRODUCTION
CONSEQUENCE OF IMPACT OR RISK	LOW	
PROBABILITY OF OCCURANCE:	DEFINITE	
DEGREE TO WHICH THE IMPACT MAY CAUSE IRREPLACEABLE LOSS OF RESOURCES	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE REVERSED	IRREVERSIBLE	
INDIRECT IMPACTS	INCREASED UNSKILLED LABOUR EMPLOYMENT	DUE TO THE SUBDIVISION AND LABOUR NEEDED. (TABLE 7.2)
CUMULATIVE IMPACT PRIOR TO MITIGATION	VERY LOW	
INTENSITY OF IMPACT	VERY LOW	
SIGNIFICANCE RATING OF IMPACT PRIOR TO MITIGATION	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE AVOIDED	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE MANAGED	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE MITIGATED	VERY LOW	
PROPOSED MITIGATION	NONE DESIRABLE OR POSSIBLE	
RESIDUAL IMPACT	PERCENTAGE LOSS OF AGRICULTURAL LAND	
CUMULATIVE IMPACT POST MITIGATION	VERY LOW	
SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION	VERY LOW	

8. CONCLUSIONS

After the site sensitivity is verified, the assessment must be undertaken based on the site inspections as well as production figures. Assessor must identify:

- The extent of the impact of the proposed development on the agricultural resources; and
- whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.

The conclusion of the assessment is that the agricultural impact of the proposed subdivision and development which is a partial loss of agricultural land, will be of very low significance. This is due to the following contributing factors:

- o Only a portion(<10% per plot) of the agricultural land will be removed from agriculture production
- o Current land use (Grazing) does not produce high amounts of agricultural output (5 LSU / 419ha)
- o Establishment of lifestyle farms, marketed as such, will attract clients that are specifically looking for a farming plot, where they can practise various agricultural activities.

Therefore the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. From an agricultural impact point of view it is recommended that the development be approved.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions.



29th March 2026

GJ Malan

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PROPOSED LAGOONBAY LIFESTYLE ESTATE DEVELOPMENT

-

ENVIRONMENTAL IMPACT ASSESSMENT

Undertaken in terms of in terms of
SECTION 21, 22 & 26 of the Environment Conservation Act
(Act 73 Of 1989), Government Notice No R1182 (As Amended)

-

IMPACT OF THE PROPOSED DEVELOPMENT ON AGRICULTURE

Prepared by B Schloms & J Lambrechts
November 2005

1 ASPECT ASSESSED

-

The aspect identified during the Scoping Process and assessed below is *'the loss of agricultural land and the subsequent loss of associated benefits and opportunities'*.

-

2 BASIS FOR THE ASSESSMENT

-

The assessment is based on the findings of the detailed soil survey carried out by Schloms & Lambrechts during July 2005. The findings of the soil survey were based on the standard assessment criteria used throughout the Western Cape, and accepted by the Department of Agriculture, namely that soil potential is based on its suitability for ***perennial crops*** rather than ***annual crops***.

3 ALTERNATIVES ASSESSED

The alternatives that were the subject of this assessment are as follows:

Alternative 1: Original proposal put forward by Dennis Moss Partnership (April 2005).

Alternative 2: Modified design to be developed to incorporate comments received during the Scoping Process.

Alternative 3: No-go option, which is the continuation of the status quo (namely as ownership existed prior to the involvement of Lagoon Bay Lifestyle Estate).

4 ASSESSMENT OF ALTERNATIVE 1

As confirmed by the soils survey, the soils of the study area have a low to low medium potential for perennial crops. In this regard, reference is made to the conclusion of the soil survey report, namely:

As is indicated by the soils map, the soils that fall in the “conditionally recommended” and “recommended” classes are distributed over the entire property, which implies that there is no single unit of meaningful extent that is suitable for cultivation of perennial crops.

In order to enable cultivation of perennial plants on those units falling into the latter two classes, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- a) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.*
- b) Breaking up of dense subsoil clay layers and underlying hard weathering rock.*
- c) Cutoff drainage.*
- d) Ridging of soils with shallow clay layers.*
- e) Judicious irrigation.*
- f) Creating and maintaining an adequate organic surface mulch.*

The soil map is extremely important for general planning, selection of amelioration measures to alleviate some of the physical soil limitations and selection of plants adapted to the soil restraints. Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

Small-scale cattle farming and a dairy were practiced on irrigated pastures comprising inter alia kikuyu, perdekweek and buffelkweek. Water for the irrigation was abstracted from the Maalgate River and small irrigation dams. Due to their small scale, such practices are not considered a financially viable land-use.

In conclusion, it is stated that, due to the lack of suitable soils, commercial agriculture, with specific reference to crop cultivation, is not a financially viable land-use in the study area.

In accordance with the above conclusion, the potential environmental impact of Alternative 1 was assessed as follows:

Criteria	Assessment
<u>Spatial extent</u>	• Site specific • Local • Regional • National
<u>Intensity</u>	Low to very low
<u>Duration</u>	Permanent
<u>Probability</u>	Definite
<u>Significance</u>	Low to very low
<u>Status</u>	Positive
<u>Confidence</u>	High

5 ASSESSMENT OF ALTERNATIVE 2

It is submitted that the aspects that were raised during the Scoping Process pertaining to agriculture in the study area, do not justify any changes to the original design for the development (i.e. Alternative 1). From an agricultural perspective, it is therefore not necessary to assess Alternative 2 or to submit any inputs in this regard.

6 ASSESSMENT OF ALTERNATIVE 3

The current situation is characterized by the following:

- A lack of any sustainable agriculture in the form of perennial crop cultivation due to low soil potential, lack of irrigation water and infrastructure.
- Only current agricultural activities are a dairy, small-scale stock farming (cattle and horses).

- c) Plethora of uneconomical units (total of 37) (i.e. smaller than the prescribed 40 ha per unit), currently primarily used as residential small-holdings.
- d) Serious infestation of alien vegetation, primarily wattle and kikuyu.
- e) Evident high level of poverty throughout the study area with specific reference to the previously disadvantaged. In this regard it is evident that agriculture has not been, and will probably not be, able to sustain an acceptable livelihood for the former owners and farm workers in the study area.

Considered in this context, it is concluded that Alternative 3 is not desirable and will lead to further deterioration of the environment and the socio-economic status of the study area.

The assessment of the potential environmental impact in this regard is as follows:

Criteria	Assessment
<u>Spatial extent</u>	• Site specific • Local • Regional • National
<u>Intensity</u>	High
<u>Duration</u>	Permanent
<u>Probability</u>	Definite
<u>Significance</u>	High
<u>Status</u>	Negative
<u>Confidence</u>	High

B. SCHLOMS

UNIVERSITY OF STELLENBOSCH

-
PROPOSED LAGOONBAY LIFESTYLE ESTATE DEVELOPMENT

-
ENVIRONMENTAL IMPACT ASSESSMENT

Undertaken in terms of in terms of
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IMPACT OF THE PROPOSED DEVELOPMENT ON AGRICULTURE

Prepared by B Schloms & J Lambrechts
November 2005

RESPONSE TO COMMENT OF DEPARTMENT OF AGRICULTURE

-
Reference is made to the comments of the Department of Agriculture on the soils study report (their reference 20/9/2/4/3/10 dated 14 November 2005).

The assessment criteria upon which the soil potential assessment in the soils report were based, namely suitability for **perennial crops** rather than **annual crops**, are the standard criteria used throughout the Western Cape and have been accepted and approved by the Department of Agriculture.

It is stated in the soils report that dispersed pockets of soils occur that are suitable for vegetable cultivation. However, in this regard, we reiterate our opinion put forward in the soils report, namely that:

In order to enable crop cultivation, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- g) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.*
- h) Breaking up of dense subsoil clay layers and underlying hard weathering rock.*
- i) Cutoff drainage.*
- j) Ridging of soils with shallow clay layers.*
- k) Judicious irrigation.*
- l) Creating and maintaining an adequate organic surface mulch.*

Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

We, therefore, confirm our opinion that crop farming, both perennial and annual, is not commercially viable option on the small units that characterize the study area.

With regard to the department's reference to the suitability of the soils for 'pastures under irrigation', we wish to note that the current situation provides conclusive evidence is not commercially viable option. None of the properties involved represents a commercial unit in terms of the criteria of the Department of Agriculture.

B. SCHLOMS

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NORTH



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APPENDIXES

Appendix 1:

Table 1	SOIL FORMS AND FAMILIES RECOGNIZED DURING THE SOIL SURVEY LISTED ALPHABETICALLY ACCORDING TO SOIL FORM ABBREVIATION SYMBOL
Table 2	SOIL MAP LEGEND
Table 3	MAP UNITS WITH COMPLETE LIST OF PROFILES AND SOIL CODES
Table 4	SOIL LIMITATIONS OF MAP UNITS
Table 5	SOIL AMELIORATION MEASURES AND SUITABILITY OF MAP UNITS

Appendix 2: STRUCTURE OF SOIL CODE AND EXPLANATION OF SYMBOLS

1	TERMS OF REFERENCE
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Messrs. LagoonBay Lifestyle Estate (Pty) Ltd during March 2005 instructed a soil survey of the portions of the farm Hoogekraal 238, George, that have been purchased by them for the purpose of undertaking a tourism-related development. The relevant portions of the farm (further referred to as the study area) are indicated on the attached soils map.

The terms of reference regarding the form of the survey and report were as follow:

- A semi-detail soil survey of the farm to determine the inherent properties, mainly physical and morphological, of the soils.
- Compilation of a soils map at a scale of 1 : 5 000 to describe the natural distribution of the soils.
- Description of the soils in the different map units in terms of their physical and morphological properties.
- To evaluate the soil suitability for agricultural use with specific reference to perennial crops and for estate planning purposes.

2 ALLOCATION OF RESPONSIBILITIES

The following individuals and organizations were responsible for the different actions:

- Mr. SW van der Merwe Junior for siting of soil profiles in the field on a grid of approximately 100 m x 200 m.

Due to ecological restraints profile pits were prohibited in certain areas with fairly pristine indigenous vegetation near the coast. No pits were also made in a section of land that is presently used by the lessee for cattle grazing.

- Management in the study area for excavation of the soil pits.
- Dennis Moss Partnership for the compilation of a base map with a colour photo background and contour lines on a scale of 1 : 5 000 and plotting of the profile positions. This map will be used as base map for the soil survey.
- The surveyors (soil specialists and compilers of this report) for describing and classifying the soil profiles.
- The surveyors will be responsible for compilation of the soils map and a report on the properties, limitations, and relative suitability of the soils for agricultural purposes, with specific reference to perennial crops.

3 TERRAIN AND PARENT MATERIAL

According to the 1 : 250 000 geological map 3322 Oudtshoorn dated 1979, the dominant underlying geological throughout the survey area is the so called Maalgate gneissic granite and granodiorite. A fairly narrow east-west zone of Pre-Cape or Malmesbury formation sediments, mainly quartz schists and phyllites, is found near the coast. In the south-western corner of the survey a small area of recent aeolian sands occurs.

Near the coast the aeolian sands are fairly deep and no underlying bedrock was found in the soil pits. Inland the sand cover gets thinner and generally overlies clay. The predominantly fine to medium sand grade of the overlying sand material might be an indication that aeolian sands have been reworked and mixed with fine sandy colluvial material that either developed from gneissic granite or even Table Mountain sandstone weathering products. Duplex soils are the dominant soil type in the areas with sand on clay. In higher lying, fairly level areas the clay is most probably old marine sediments while in more dissected areas the clay has developed directly from weathering of the underlying gneissic granite, schist or phyllite. In the well-drained incised areas with fairly steep slopes podzolic soils are dominant.

The eastern boundary of the survey area is the Maalgate River, with the N2 road the northern and the road from Glentana the eastern boundary. In the south-western corner the southern boundary extends to the coast. To the east the southern boundary shifts inland and is approximately 259 m to 500 m away from the coast.

The slopes along the eastern and southern sections of the farm are very steep due to dissection by numerous small streams that drain into the Maalgate River or flow towards the coast. The central and northern sections of the farm have an undulating terrain with slopes that range from as low 2.5 % to about 6 %. The crest height of the undulating hills increase from approximately 180 m near the coast to 205 m in the northeast.

4 DESCRIPTION AND CLASSIFICATION OF SOIL PROFILES

During the soil survey a total of 223 soil pits were made on the farm. The soils were investigated in the field and the more important properties described following standard procedures.

Based on recognizable, as well as inferred properties, the soils were classified according to the South African soil classification system (**Soil Classification Working Group, 1991**) into soil forms and soil families. This system is based on the recognition of diagnostic soil horizons and materials.

Soil forms are defined in terms of the type and vertical sequence of diagnostic horizons or materials. For communication, soil forms are given locality names, e.g. Estcourt or Kroonstad. These names are abbreviated to two-letter symbols, e.g. Es for the Estcourt form. Soil forms are subdivided into soil families using properties that are not used in the definition of diagnostic horizons or materials. Reference to a soil family is by combining the soil form abbreviation and a four-digit symbol, e.g. Es 1200 is family number 1200 of the Estcourt form. In **Appendix 1: Table 1** all the soil forms and families recognized during the soil survey is listed alphabetically according to the soil form abbreviation symbol.

Depending on the purpose of the soil survey, soil families can be subdivided on an *ad hoc* basis into soil phases using properties such as soil and horizon depths, stoniness etc. Phase subdivision is achieved by detail coding of individual soil profiles (refer to **Appendix 3: Structure of Soil Code and Explanation of Symbols** for the symbols used during this survey). Codes of all the profiles described are listed alphanumerical according to the Map legend abbreviations in **Appendix 1: Table 2**.

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Soil Classification Working Group, 1991. Soil Classification: A Taxonomic System for South Africa. Mem. Natural Agric. Resources for S.A. No. 15.

5 MAP LEGEND AND SOIL MAP

The aim of a soils map is to reflect the natural distribution of soil types and spatial variation in soil properties on any particular farm or area. Depending on the relationship between soil parent material, soil types and terrain, the spatial variation in soil properties and the influence of these variations on land use and soil suitability for specific agricultural activities, different approaches could be followed to develop a map legend according to which a soils map is compiled.

The approach that was followed for the study area, was to develop a map legend that will accommodate most of the variations in soil properties that might have an effect on soil suitability, amelioration measures and potential land use. In **Appendix 1: Table 2** the map legend that was developed for the study area is explained. The properties and features of the different map units are defined in terms of *inter alia*:

- soil form,
- diagnostic horizon(s),
- relevant family criteria,
- degree of wetness of the upper and lower subsoil horizons,
- density of upper and lower subsoil horizons,
- depth to limiting horizons/materials,
- coarse fragments in top- and/or upper subsoil horizons, and
- sand grade and clay content of the topsoil.

With reference to the accuracy of the soil map, the following aspects should be kept in mind:

- The most important factor that determines the accuracy of the soils map is the accuracy of the base map itself and in particular the positioning of the soil pits with reference to land features such as roads, fences, lands and streams.
- According to the terms of reference the profile pits were made on a grid of approximately 100 m x 200 m. This means that the minimum size of a map unit is approximately 2.0 ha. Map units smaller than 2.0 ha could therefore be included in larger soil units on the map.
- In situations where the boundaries between map units coincide with fairly prominent changes in slope, the soil boundaries are usually relatively accurate within the 100 – 200 m spacing between soil pits. In cases where slope changes are gradual, the soil boundaries are only approximate divisions.

The final soil map units are shown on the 1 : 5 000 base map. Map units are identified by means of a symbol that consists of the abbreviation for the soil form followed by an Arabic number (e.g. Es 1). The number suffix has no intrinsic meaning. It only serves as an identifier for different map units that consist of soils belonging to the same soil form, but differ in one or more important soil properties.

The map units are listed alphanumerical according to the soil form symbol in **Appendix 1: Table 2**. All the profiles and codes in the different map units are listed alphanumerical in **Appendix 1: Table 3** (also see **SOIL MAP**).

Certain properties (e.g. horizon/soil depth, coarse fragments, etc.) of the soils in map unit individuals are specified in **Appendix 1: Table 2**. Additional properties can be abstracted from the:

- definition of the soil form in terms of diagnostic horizons and materials,
- properties of diagnostic horizons and materials,
- differentiating family criteria, and
- additional information specified in the soil code.

Due to their genetic composition the lateral and vertical root growth pattern may vary significantly between different types of plants. The minimum useable soil depth required for good root development and water and nutrient uptake to ensure healthy and productive plants can therefore differ greatly between different plant types. In addition, the tolerance of different plants to soil wetness and soil borne diseases may also vary greatly.

In the following paragraphs the most important soil properties that may directly affect root development and nutrient and water uptake, and indirectly the potential for infestation with soil borne diseases will be discussed.

6.1 Dense subsoil clay layers

In most soil forms dense clay layers occur as gleyed (wet), weakly to moderately structured G horizons (e.g. Kroonstad form), relatively dry well structured B horizons, (e.g. Estcourt and Sterkspruit Swartland form), or as unspecified material below a non-structured diagnostic B horizon (e.g. Lamotte, Pinedene and Tukulu form)

If the clay increase from the overlying horizon to the clay layer is clear or abrupt (sharp), free water generally accumulates in the overlying, lighter textured horizon during the rainy season or as a result of over-irrigation. Under conditions of water saturation, reduction and loss of iron leads to the development of a bleached E horizon in the overlying sandy material (e.g. Estcourt and Kroonstad form). Such horizons can set hard when they dry out and have a high soil density.

The effective depth of soils with structured subsoil clay layers is therefore limited by the clay layer itself and indirectly by the periodic wetness in the overlying layer with less clay.

If the clay layer is thin enough (<30 cm) and occurs on material that is more porous and/or that can be loosened (e.g. weathering gneissic granite), all attempts must be made to destroy the clay layer as a horizontally continuous horizon. If it cannot be improved mechanically because of its depth or thickness, then ridging or mounding the topsoil is the only way to increase effective soil depth.

6.2 Wetness

This refers to the presence of free water at varying depths in a soil profile.

In the study area wetness occurs mostly as a **perched water table**. This refers to the accumulation of free water in E horizons that may develop above a G horizon (Kroonstad form) and prismaeutanic B horizon (Estcourt form). Soil families with a "yellow" E horizons are generally less hydromorphic and show a more friable consistency than families with a "grey" E. Perched water tables are also present in deep, gleyed layers with a loamy to clayey texture below neoeutanic B horizons (e.g. Lamotte, Pinedene and Tukulu form).

Another form of wetness develops as a result of low permeability in G horizons and in weathering gneissic granite that is present in the majority of soil profiles described.

During the field survey the soil water condition in individual soil profiles was evaluated according to the wetness classification that was developed for soils in the winter rainfall region (refer to **Appendix 3**). This wetness classification is based on the number of days during the year and depth of saturation with water. Profile morphology is used to determine the depth of water saturation and the maximum height of signs of hydromorphy is used as depth limit. Climate, locality, aspect, vegetation and water conditions during the survey as well as profile morphology are used to evaluate the duration of water saturation. The expected number of days of saturation during the rainy season in "wet" years is used to determine duration. It is essential for free water to occur in the profile continuously for at least seven (7) days. However, the total number of days with free water need not be continuous. The wetness rating for the individual profiles are listed in **Appendix 1: Table 3**.

Wetness during active root respiration results in a low oxygen concentration with an increased carbon dioxide concentration. This causes reduction of iron oxides/hydroxides and leaching of the reduced iron. As the iron content decreases soil density increases and very large soil strengths can develop when the soil dries out.

Other adverse effects of wetness are:

- Toxic concentrations iron (Fe^{2+}), manganese (Mn^{2+}), sulfides, nitrites, ethylene and volatile organic acids can develop. In certain plants a moderate degree of wetness will only have a negative influence on

growth without dieback of the plants. Sensitive plants, however, can dieback.

- Various diseases can become epidemic under wet conditions. *Phytophthora* in particular can wipe out sensitive crops/plants.
- As a result of limited volumes of non-wet soil that is available for root growth, plants have a restricted root system during the wet season. Crops with a high water requirement may show drought stress during warm and/or dry spells if water content becomes very low.

If the surveyed area is going to be planted with wetness sensitive plants special attention should be given to drainage. It is recommended that a drainage expert is consulted to develop an integrated drainage plan for the total area intended for agricultural development.

6.3 Underlying weathering rock

Gneissic granite in different stages of weathering (it varies from soft, highly weathered to hard, unweathered) occurs in most soils described in the study area as a deep subsoil material (saprolite or hard rock) below the diagnostic horizon sequences characteristic of the different soil forms.

Although such materials are always denser and more impervious to air, water and plant roots than the overlying horizons, the degree of weathering and original structure has a great influence on the intensity of the limitation. Non-hard, fairly highly weathered gneissic granite is reasonably open and porous. The shallower the rock, the less weathered and the harder it is, the greater is the negative influence on root development and water infiltration.

As a result of its dense, impermeable nature, weathering rock normally shows signs of wetness in humid environments, on fairly flat hill crests and concave lower positions.

Other limitations associated with weathering rock are the presence of soluble salts as well as varying quantities of coarse fragments.

Hard, weathering rock that has been loosened has a rapid hydraulic conductivity and free water flows freely through the profile. It is therefore essential that cutoff drains are installed.

6.4 Low clay content in upper part of the profile

In addition to the soils in the study area that have developed from aeolian sands, all the soils are characterized by a fairly sandy colluvial surface horizon (topsoil). Depending on the terrain position where a particular soil might occur, the surface colluvial layer was subjected to varying degrees of sorting and removal of the silt and clay fractions, and accumulation of the sand fraction. Depending on the degree of sorting and silt and clay removal the clay content of the topsoil layers may range from as low as < 5 % to a maximum of about 10 %.

In addition the colour of the topsoil of most soils in the study area is bleached (pale) in the dry state. This is an indication of a low organic matter content.

The ability of soils to retain water and plant nutrients for use by plants is determined mainly by the clay and organic matter content. A clay content of less than 8 - 10 % is generally associated with a water storage capacity that is low enough to be considered as a growth limiting factor. A low clay content is regarded as a limitation because sandy soils dry out fairly quickly and can become very warm during the summer. It is therefore difficult to maintain the plant available water at an optimal level during warm summer months and when plants are young with a small leaf canopy. Another limitation of sandy topsoil with low a organic matter content is their susceptibility for water erosion.

It is therefore important that plants should be irrigated during dry periods to ensure minimum water stress and maximum growth.

6.5 Course fragments in top- and/or subsoils

Certain soils in the study area contain coarse material that ranges from predominantly fine (2 - 25 mm) to coarse gravel (25 - 75 mm) and rarely stones (75 - 250 mm).

The main limitation of coarse fragments is that with an increase in the volume-content of coarse fragments, the fraction of fine soil material (<2 mm) becomes smaller and the water holding capacity decreases. The nutrient retention capacity is similarly influenced.

Coarse fragments results in an increase in the total, as well as macro-porosity of the soil. Gravelly soils are better aerated, with a rapid hydraulic conductivity compared to similar non-gravelly soils. Dry, gravelly soils, therefore, require

less water to reach field water capacity but require more regular and lighter irrigations than similarly textured, non-gravelly/stony soils. Fertilizer programs should also be adjusted.

In **Table 1** the classes and symbols that are used in **Appendix 1: Table 4** to qualify the physical limitations of the soils in the different map units are explained.

Table 1 **Classes used to qualify the physical limitations of soils in the different map units.**

Abbreviation	Limitation class
(no symbol)	None
Low	Low
Mod	Moderate
Sev	Severe

7 AMELIORATION OF PHYSICAL SOIL LIMITATIONS

Except for the low clay content, the physical limitations can be improved or alleviated by means of drainage, ridging, mixing of top- and upper subsoil (except in cases where clay directly underlies the topsoil) and breaking up of the subsoil clay layer or underlying rock. Specific recommendations can, however, only be made on a soil type – plant type basis.

In **Table 2** the classes that are used **Appendix 1: Table 5** to specify the necessity of a specific amelioration measure is explained.

Table 2 **Classes used to specify the necessity of specific amelioration measures.**

Necessity for amelioration measure	Abbreviation
Measure unnecessary	(none)
Measure recommended but not essential	Recom
Measure essential	Essen

The recommended amelioration practices for the soils in the different map units are listed in **Appendix 1: Table 5**.

8 SOIL SUITABILITY WITH SPECIAL REFERENCE TO PERENNIAL CROPS

The most common limitations of the soils in the study area are dense subsoil clay layers, wetness, underlying hard to very hard weathering gneissic granite and locally fine and coarse gravel in the top- and upper subsoil. The general suitability of individual soil profiles for the commercial production of perennial crops was accordingly evaluated in the field by the soil surveyors.

The suitability rating ranges from 1 to 10, with 1 the lowest and 10 equal to the highest or best suitability. These ratings are listed in **Appendix 1: Table 3** for each profile, and the average rating for each map unit in **Appendix 1: Table 5**. The average suitability rating for map units was calculated from the individual profile ratings.

These ratings can be interpreted according to the guidelines in **Table 3**.

Table 3 Interpretation of suitability ratings and percentage of soil profiles in each rating class.

Rating	General suitability		Percent of class
≤2	Very low	Not recommended	0.9
>2 - ≤4	Low	Not recommended	58.3
>4 - ≤5	Medium	Conditionally recommended	28.3
>5 - ≤6	Medium high	Recommended	12.1
>6 - ≤8	High	Highly recommended	0.4
>8	Very high	Highly recommended	0.0

From **Table 3** above it is evident that most of the soils in the study area have a low suitability rating for perennial plants. Approximately 60 % of the soils are not recommended for perennial plants, while about 28 % falls in the class “conditionally recommended” and 12 % in the class “recommended”.

9 CONCLUSION

As is indicated by the soils map, the soils that fall in the “conditionally recommended” and “recommended” classes are distributed over the entire property, which implies that there is no single unit of meaningful extent that is suitable for cultivation of perennial crops.

In order to enable cultivation of perennial plants on those units falling into the latter two classes, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- a) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.
- b) Breaking up of dense subsoil clay layers and underlying hard weathering rock.
- c) Cutoff drainage.
- d) Ridging of soils with shallow clay layers.
- e) Judicious irrigation.
- f) Creating and maintaining an adequate organic surface mulch.

The soil map is extremely important for general planning, selection of amelioration measures to alleviate some of the physical soil limitations and selection of plants adapted to the soil restraints. Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

Small-scale cattle farming and a dairy were practiced on irrigated pastures comprising *inter alia* kikuyu, perdekweek and buffelkweek. Water for the irrigation was abstracted from the Maalgate River and small irrigation dams. Due to their small scale, such practices are not considered a financially viable land-use.

In conclusion, it is stated that, due to the lack of suitable soils, commercial agriculture,

with specific reference to crop cultivation, is not a financially viable land-use in the study area.

B. SCHLOMS

SOIL SPECIALIST

LAND TYPE / LANDTIP : **Db114**

CLIMATE ZONE *KLIMAATZONE* : 697H

Area / *Oppervlakte* : 8597 ha

Estimated area unavailable for agriculture

Beraamde oppervlakte onbeskikbaar vir landbou : 200 ha

Occurrence (maps) and areas *Voorkoms (kaarte) en oppervlakte* :

3322 Oudtshoorn (8597 ha)

Inventory by *Inventaris deur* :

B H A Schloms

Modal Profiles *Modale profiele* :

None / Geen

Terrain uni <i>Terreineenhei</i>	:	1	2	3	4	5
% of land type <i>% van landtipe</i>	:	37	1	52	4	6
Area <i>Oppervlakte (ha)</i>	:	3181	86	4470	344	516
Slope / <i>Helling (%)</i>	:	0 - 3	>100	3 - 10	2 - 4	0 - 3
Slope length <i>Hellingslengte (m)</i>	:	800 - 1500	50 - 100	300 - 800	200 - 300	100 - 200
Slope shape <i>Hellingsvorm</i>	:	Y	Y	Y	X	X
MB0, MB1 (ha)	:	3022	0	4247	344	361
MB2 - MB4 (ha)	:	159	86	224	0	155

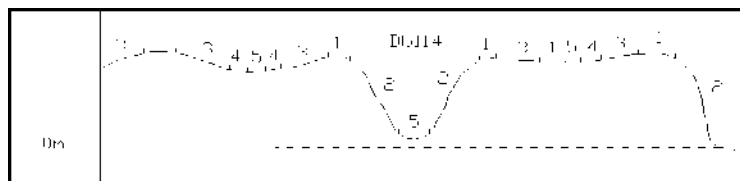
**Depth
limiting
material**

Soil series or land classes <i>Grondseries of landklasse</i>	Depth <i>Diepte</i>											Total <i>Totaal</i>		Clay content % <i>Klei-inhoud %</i>			Texture <i>Tekstuur</i>		<i>Diepte-beperkende materiaal</i>
		(mm)	MB :	ha	%	ha	%	ha	%	ha	%	ha	%	A	E	B21	Hor	Class / Klas	
<i>Soil-rock complex</i>			:																
<i>Grond-rotskompleks:</i>			:																
Rock/Rots			4 :	64	2	52	60	134	3			249	2.9						
Mispah Ms10	50-200		3 :	95	3	34	40	89	2			219	2.6	6-12			A	meSa-LmSa	R
Dohne Es13, Langkloof Es21	400-700		0 :	1909	60			2458	55	52	15	4419	51.4	3-10	3-12	40-60	E	meSa-LmfiSa	pr
Stanford Ss23	250-500		0 :	477	15			581	13			1058	12.3	6-15		35-55	A	LmfiSa	pr
Kroonstad Kd13, Mkambati Kd14,			:																
Bluebank Kd16, Umtentweni Kd21	500-800		0 :	159	5			447	10	138	40	744	8.7	3-12	3-18	40-55	E	meSa-fi/meSaLm	gc
Swartland Sw31, Hogsback Sw32	200-500		0 :	95	3			224	5			319	3.7	10-20		35-60	B	fiSaClLm-Cl	vp
Oribi Gs11, Kanonkop Gs13,			:																
Platt Gs14	250-600		0 :	64	2			224	5			287	3.3	3-12		10-25	A	meSa-Lmfi/meSa	so
Waisand Lo11, Longlands Lo21	600-800		0 :	64	2			89	2	34	10	239	2.8	6-10	6-10	10-15	E	Lmfi/meSa	sp
Dundee Du10	>1200		0 :								206	2.4	10-15				A	LmfiSa	
Shorrocks Hu36	600-1200+		0 :	64	2			134	3			198	2.3	15-20		20-35	B	fiSaClLm	R
Rondevlei Wa20	400-600		0 :	64	2			89	2	17	5	170	2.0	3-6	3-6		E	meSa	hp
Westleigh We11, Rietvlei We12	500-700		0 :							34	10	138	1.6	8-15		10-35	B	LmfiSa-SaClLm	sp
Laparis Lt11	>1200		0 :	64	2					34	10	98	1.1	3-6	3-6	8-12	E	meSa	
Fernwood Fw11	>1200		0 :	64	2					34	10	98	1.1	3-6			A	meSa	
Stream beds/Stroombeddings			4 :								155	30	155	1.8					

LAND TYPE / LANDTIP : **Db114** Continued *Vervolg*

Terrain type *Terreintipe* : A4

Terrain form sketch *Terreinvormskets*



For an explanation of this table consult LAND TYPE INVENTORY (table of contents)

Ter verduideliking van hierdie tabel kyk LANDTIPE - INVENTARIS (inhoudsopgawe)

Geology: Mainly gneissic granite and granodiorite.

Geologie Hoofsaaklik gneisige graniet en granodioriet.

WATER USE CALCULATIONS

Vegetable Type	Period	Growing Period	Rainfall in growing period (mm)	Maximum Supplemental Irrigation* (mm)	Monthly Water Use* (m3)	Area per crop (m2)
Cabbage	2-3 months	Year round	25-300	550	18	100
Tomato	3-6 months	Year round	120-530	580	19	100
Onion	6 months	Sept-Feb	700	150	5	100
Green Peppers	3-6 months	Year round	120-530	1230	41	100
Potato	6 months	Sept-Feb	700	150	5	100
Total Per month:					89	500

*Water Use from FAO Database

*Maximum Supplemental Irrigation: Baseline 100mm

*Monthly Water Use for 10x10m plot, drip irrigation.

	Maximum usage per Month (m3/month)
Livestock / Poultry	
Cattle	3
Sheep	0.6
Chicken	0.012
Game	3