Johann Lanz
Soil Scientist (Pr.Sci.Nat.)
Reg. no. 400268/12

Cell: 082 927 9018
e-mail: johann@johannlanz.co.za

1A Wolfe Street
Wynberg
7800
Cape Town
South Africa

SITE SENSITIVITY VERIFICATION
FOR THE PROPOSED GWAYANG MIXED USE DEVELOPMENT
IN GEORGE, WESTERN CAPE PROVINCE

Report by
Johann Lanz

31 May 2024

Table of Contents

1 METHODOLOGY OF STUDY

The assessment was based on an on-site investigation of the soils and agricultural conditions conducted on 25 January 2024. It was also informed by existing climate, soil, and agricultural potential data for the site (see references). The aim of the on-site assessment was to:

1. ground-truth cropland status;
2. assess the soil potential;
3. gain an understanding of overall agricultural production potential across the site.

Soils were assessed based on the investigation of existing soil exposures in combination with indications of the surface conditions and topography, and strategically positioned auger samples where necessary. Soils were classified according to the South African soil classification system (Soil Classification Working Group, 2018).

An assessment of soils and long-term agricultural potential is in no way affected by the season in which the assessment is made, and therefore the date on which this assessment was done has no bearing on its results. The level of agricultural assessment is considered entirely adequate for an understanding of on-site agricultural production potential for the purposes of this assessment.

2 SITE SENSITIVITY VERIFICATION

A specialist agricultural assessment is required to include a verification of the agricultural sensitivity of the development site as per the sensitivity categories used by the web-based environmental screening tool of the Department of Forestry, Fisheries and the Environment (DFFE). Agricultural sensitivity is an indication of the capability of the land for agricultural production, based only on its climate, terrain, and soil capabilities and its agricultural land use. The different categories of agricultural sensitivity indicate the priority by which land should be conserved as agricultural production land. However, the screening tool's agricultural sensitivity is often of very limited value for assessing agricultural impact. What is of importance to an agricultural assessment, rather than the site sensitivity verification, is its assessment of the cropping potential and its assessment of the impact significance, both of which are not necessarily correlated with sensitivity.

The screening tool classifies agricultural sensitivity according to two independent criteria, from two independent data sets, both of which may be indicators of the land's agricultural production potential but are limited in that the first is outdated and the second is fairly course, modelled data. The two criteria are:

1. whether the land is classified as cropland or not on the field crop boundary data set (Crop Estimates Consortium, 2019), and

2. its land capability rating on the land capability data set (DAFF, 2017)

All classified cropland is, by definition, either high or very high sensitivity. Land capability is defined as the combination of soil, climate, and terrain suitability factors for supporting rain-fed agricultural production. It is rated by the Department of Agriculture's updated and refined, country-wide land capability mapping (DAFF, 2017). The higher land capability values (≥8 to 15) are likely to indicate suitability as arable land for crop production, while lower values (<8) are likely to only be suitable as non-arable grazing land. The direct relationship between land capability rating, agricultural sensitivity, and rain-fed cropping suitability is shown in Table 1.

Table 1: Relationship between land capability, agricultural sensitivity, and rain-fed cropping suitability.

Land capability value	Agricultural sensitivity	Rain-fed cropping suitability
1 - 5	low	Unsuitable
6 - 8	medium	Unsuitable to marginally suitable
9 - 10	high	Suitable
11 - 15	very high	Suitable

The agricultural sensitivity of the site, as classified by the screening tool, is shown in Figure 2. However, the screening tool sensitivity requires specialist verification because of the limitations of the data sets on which it is based.

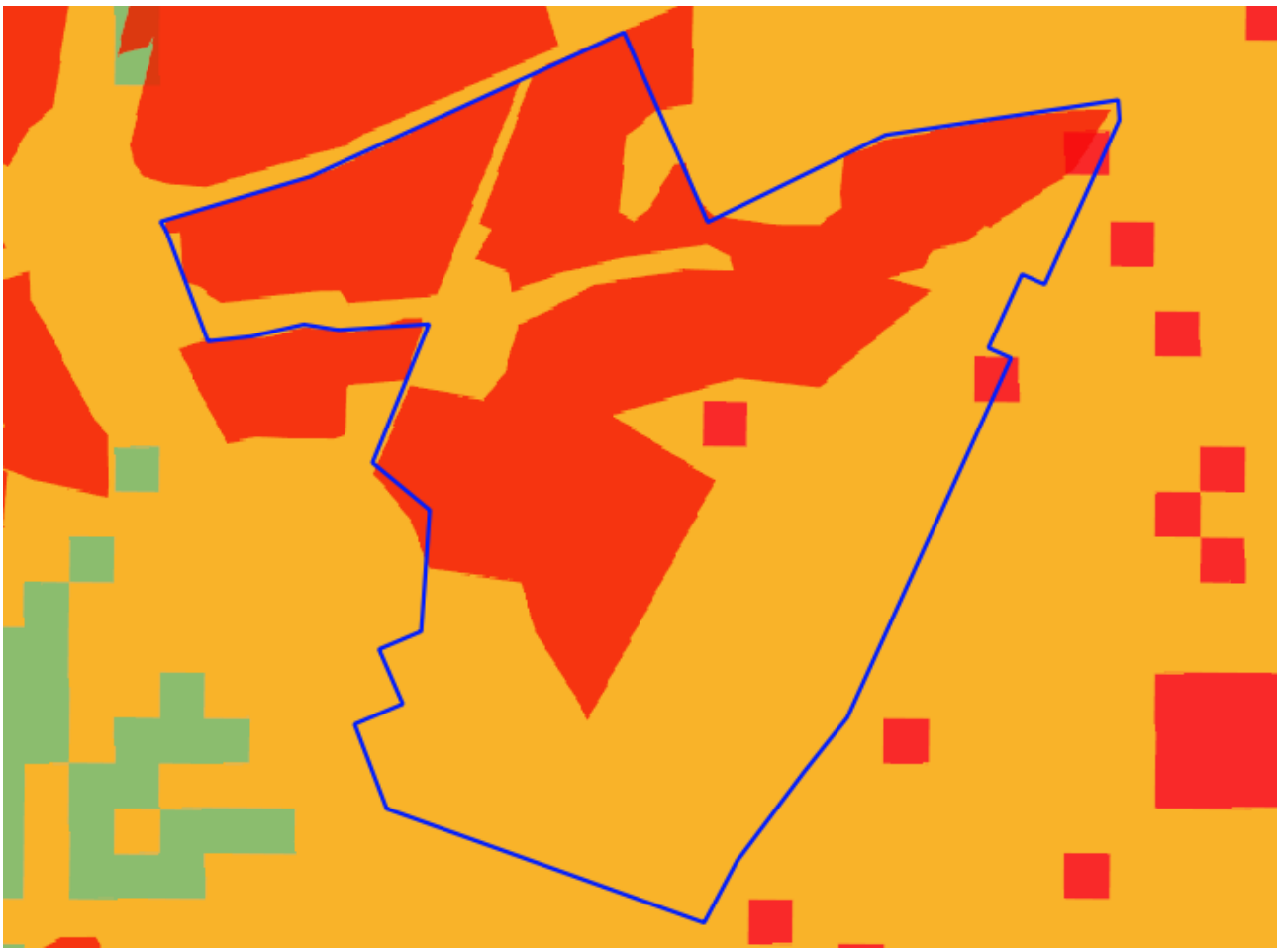

Figure 1. *The development footprint overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high; dark red = very high). The screening tool's high sensitivity is disputed by this assessment, which rates the entire assessed footprint as being of medium agricultural sensitivity.*

This verification of sensitivity addresses both components that determine it, namely cropping status and land capability. The screening tool classifies the assessed area as ranging from medium to high agricultural sensitivity. The high sensitivity classification is due to a combination of some land being classified as cropland and some (only 3 pixels) being classified with a land capability of 9. However, the data set used by the screening tool to classify cropland is outdated. All land across the footprint is no longer used or viable as cropland. This land should not, therefore, still be classified as cropland and allocated high sensitivity because of it. This assessment therefore disputes the high sensitivity rating by the screening tool that is based on cropping status.

The classified land capability of the site ranges from 6 to 9. This assessment disputes a classified land capability of >7, based on an assessment that the site is unsuitable for viable rain-fed crop production (see following section). The appropriate land capability of land that is unsuitable for viable rain-fed crop production is ≤7 because the relationship between land capability and agricultural production potential is such that a land capability of >7 should denote land that is

suitable (or at least marginal) for viable rain-fed crop production (see Table 1). This assessment therefore rates the entire proposed footprint as having a maximum land capability of 7.

In conclusion, this assessment disputes the high sensitivity classification of the assessed area by the screening tool and rates the entire assessed area as being of medium agricultural sensitivity with a maximum land capability of 7 because of its assessed agricultural production potential and current agricultural land use.

3 BASELINE DESCRIPTION OF THE AGRO-ECOSYSTEM

The purpose of this section is firstly to present the baseline information that controls the agricultural production potential of the site and then to assess that potential. Agricultural production potential, and particularly cropping potential, is one of three factors that determines the significance of an agricultural impact, together with size of footprint and duration of impact.

All the important parameters that control the agricultural production potential of the site are given in Table 2. The land type soil data are given in Appendix 1. A satellite image map of the development site is given in Figure 2 and photographs of site conditions are shown in Figures 3 to 4.

The site falls outside of an area that is classified as a Protected Agricultural Area (PAA) (DALRRD, 2020). A PAA is a demarcated area in which the climate, terrain, and soil are generally conducive for agricultural production and which, historically, or in a regional context, has made important contributions to the production of the various crops that are grown across South Africa. Within PAAs, the protection, particularly of arable land, is considered a priority for the protection of food security in South Africa, but the protection of land outside of these areas is generally not considered a food security priority.

Table 2: Parameters that control and/or describe the agricultural production potential of the site.

	Parameter	**Value**
Climate	Köppen-Geiger climate description (Beck *et al*, 2018)	Arid, steppe, cold
	Mean Annual Rainfall (mm) (Schulze, 2009)	697 to 749
	Reference Crop Evaporation Annual Total (mm) (Schulze, 2009)	955 to 985
	Climate capability classification (Ranges from 3 to 8) (DAFF, 2017)	6 (moderate-high) to 7 (high)

	Parameter	Value
Terrain	Terrain type	Coastal plain with incised rivers
	Terrain morphological unit	Valley bottom to crest
	Slope gradients (%)	Predominantly up to approximately 5% but steeper in places.
	Altitude (m)	190
	Terrain capability classification (Ranges from 2 to 8) (DAFF, 2017)	3 (low) to 7 (high)
Soil	Geology (DAFF, 2002)	Mainly gneissic granite and granodiorite, as well as phyllite, schist, grit, hornfels and quartzite of the Kaaimans Group, and quartzitic sandstone of the Table Mountain Group, Cape Supergroup.
	Land type (DAFF, 2002)	Db33
	Description of the soils	Very shallow to moderately deep, light textured, imperfectly drained duplex soils on underlying structured clay on weathered granite.
	Dominant soil forms	Estcourt, Sterkspruit, Longlands, Kroonstad
	Soil capability classification (Ranges from 1 to 8) (DAFF, 2017)	3 (low) to 4 (low-moderate)
	Soil limitations	limited soil depth, low water and nutrient holding capacity of the sandy upper soil horizons, and limited drainage
Land use	Agricultural land use in the surrounding area	Non-agricultural, pastures, irrigated crops
	Agricultural land use on the site	Pastures
General	Long-term grazing capacity (ha/LSU) (DAFF, 2018)	72
	Land capability classification (Ranges from 1 to 13) (DAFF, 2017)	6 (low-moderate) to 9 (moderate-high)
	Within Protected Agricultural Area (DALRRD, 2020)	No

Figure 2. *Satellite image map of the development boundary.*

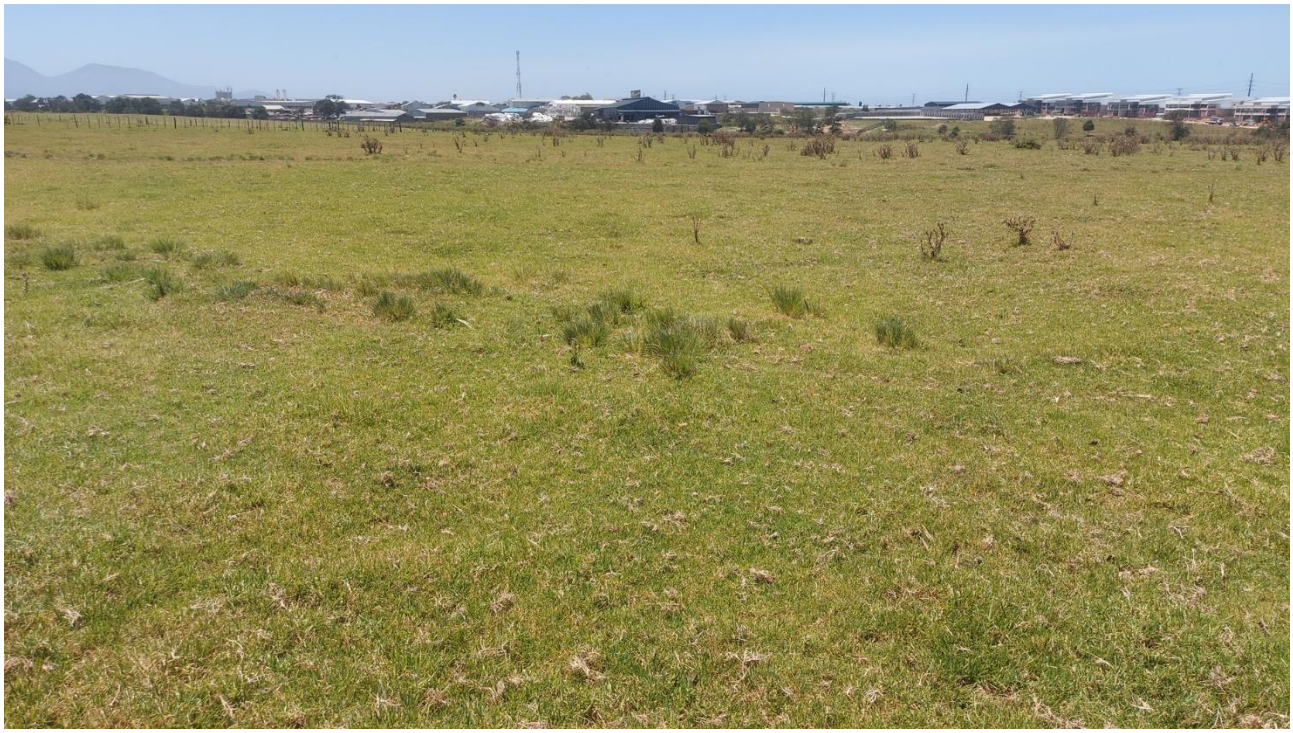

Figure 4. *Typical site conditions showing pastures.*

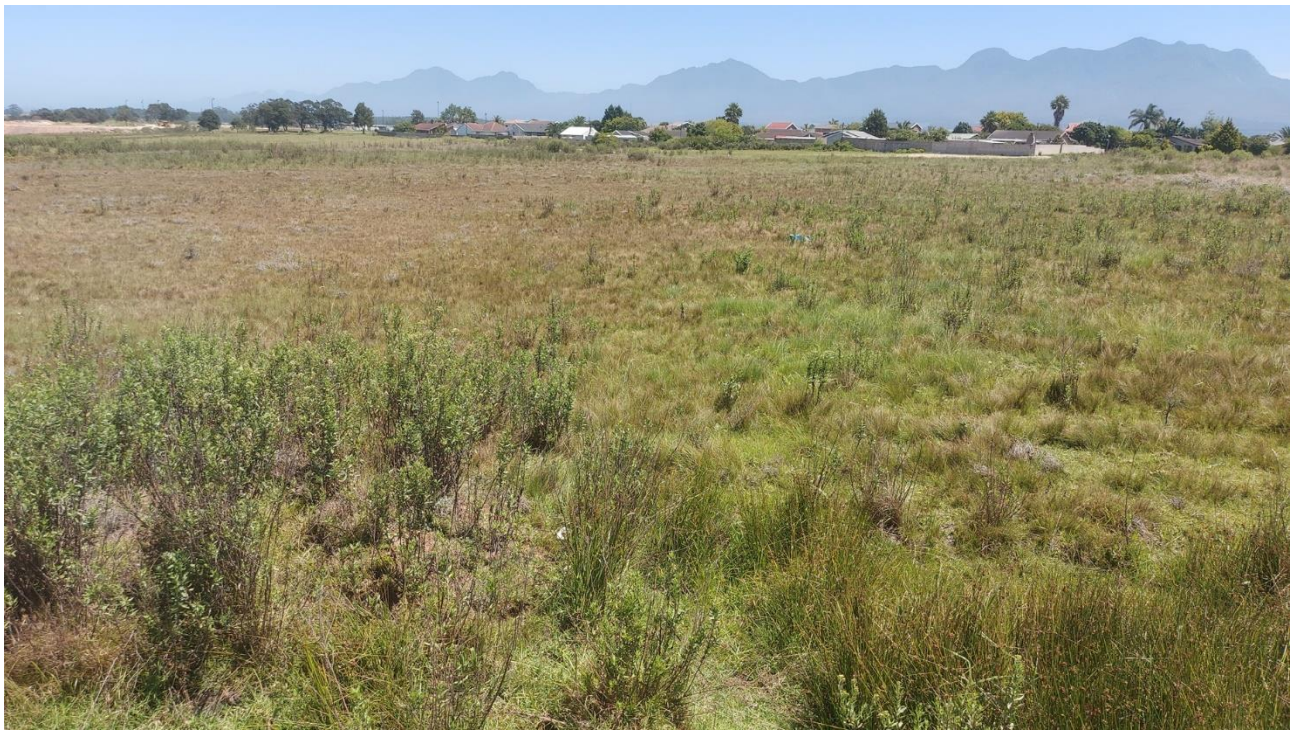

Figure 5. *Typical site conditions showing pastures.*

3.1 Assessment of the agricultural production potential

This assessment of the agricultural production potential of the site is based on an integration of the different parameters in Table 2 above and the on-site soil investigation.

The climate and terrain are suitable for a range of crop types, as grown in the surrounding area but the cropping potential of the site is limited by soil constraints, as identified in Table 2. The constraints are limited soil depth, low water and nutrient holding capacity of the sandy upper soil horizons, and limited drainage. Because of these constraints, the site is marginal for viable rainfed crop production and its viable agricultural use is more suited to grazing. The site would be suitable for crop production of specific crops under irrigation, if irrigation water was available.

Although rain-fed cropping may have been done on the site in the past, such production is no longer economically viable. It should be noted that cropping potential changes with a changing agricultural economy over time. Poorer lands that may have been cropped with economic viability in the past, are abandoned as cropland because they become too marginal for viable crop production in a more challenging agricultural economy, with increased input costs.

4 CONCLUSION

The site is classified as medium to high agricultural sensitivity by the screening tool. This has been disputed by this assessment, because of the agricultural production potential and current agricultural land use, and the entire site is rated by this assessment as being of medium agricultural sensitivity.

5 REFERENCES

Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution, Nature Scientific Data. Available at: https://gis.elsenburg.com/apps/cfm/.

Crop Estimates Consortium, 2019. Field Crop Boundary data layer, 2019. Pretoria. Department of Agriculture, Forestry and Fisheries.

Department of Agriculture Forestry and Fisheries (DAFF). 2018. Long-term grazing capacity map for South Africa developed in line with the provisions of Regulation 10 of the Conservation of Agricultural Resources Act, Act no 43 of 1983 (CARA), available on Cape Farm Mapper. Available at: https://gis.elsenburg.com/apps/cfm/

Department of Agriculture, Forestry and Fisheries (DAFF). 2017. National land capability evaluation

raster data layer, 2017. Pretoria.

Department of Agriculture, Forestry and Fisheries (DAFF). 2002. National land type inventories data set. Pretoria.

Department of Agriculture, Land Reform and Rural Development (DALRRD). 2020. Protected agricultural areas – Spatial data layer. 2020. Pretoria.

Schulze, R.E. 2009. South African Atlas of Agrohydrology and Climatology, available on Cape Farm Mapper. Available at: https://gis.elsenburg.com/apps/cfm/

Soil Classification Working Group. 2018. Soil Classification: A Natural and Anthropogenic System for South Africa. ARC-Institute for Soil, Climate and Water, Pretoria.

APPENDIX 1: SOIL DATA

Table 3. Land type soil data

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Db33	Es	250 - 700	3 - 12	30 - 65	pr	50.0
Db33	Ss	250 - 400	3 - 12	40 - 60	pr	13.0
Db33	Lo	500 - 800	6 - 15	20 - 35	sp	9.0
Db33	Kd	500 - 800	8 - 20	40 - 50	gc	8.5
Db33	Sw	200 - 500	10 - 20	40 - 60	vp	4.5
Db33	Wa	400 - 600	3 - 12		hp	4.1
Db33	We	300 - 500	6 - 15	10 - 35	sp	3.0
Db33	Gs	400 - 600	3 - 12	10 - 20	so	2.5
Db33	S					2.5
Db33	R					1.0
Db33	Ms	50 - 200	3 - 6		R	1.0
Db33	Hu	800 > 1200	10 - 25	20 - 45	R	0.9