Appendix 3c – Soil Assessment

Norm for the Exclusion of the Development and Expansion of Solar Photovoltaic facilities in areas of Low or Medium Environmental Sensitivity

Development and operation of a 1.5 MW Solar Photovoltaic facility located on a 1.7 ha area on Portion 16 of Tygerfontein 347, Albertinia

SOIL SURVEY OF PORTIONS of FARM TYGERFONTEIN 347, Albertinia

for the development of a solar and golf estate

Prepared by:

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30TH July 2026

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TERRAmap

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1. SUMMARY

1.5 MW solar facility is to be implemented by the developer in the northern eastern corner (1.7 ha) of portion 16 of Farm Tygerfontein 347 in Albertinia and a residential development and golf course is planned to be developed on the remaining area (subject to future environmental authorisation process). The surveyed area has been modified from long term agricultural use (grazing) (western and southern sections) and a brick making facility located in the northern and eastern sections of the surveyed area.

A soil survey of 49.2 ha was conducted on 21st February and again on 1st June 2026 on portions of Tygerfontein 347, to assess the agricultural potential of the land and to verify the level of environmental sensitivity identified by the national web based environmental screening tool (screening tool) for agricultural resources. Figure 1 shows the location of the area that was surveyed. Figure 2 shows the solar facility area.

Thirty-two soil augers were drilled across portion 16 and the soil profiles described. The data was used to delineate like soil bodies. A soil map (Figure 4) provides the spatial location of these soil bodies; Figure 5 shows the locations of auger sites on / in close proximity to the solar site.

The report incorporates data on the different soils and provides soil suitability ratings for both dryland and irrigated cropping and suggested soil preparation methods. **Figure 6** gives a general agricultural potential for dryland crops. Appendix I illustrates some of the soil types on the land surveyed. Appendix II provides the soil descriptions of each soil pit. Appendix III provides preferable soil requirements for growing maize and wheat.

The soils range from very shallow soils on hard rock to deep aeolian sands with considerable variation in soil type over short distances.

The agricultural potential of the land was rated as **very high** in the DFFE screening tool report. However, the agricultural potential of most of the land **is verified as low** due to the dominantly shallow soils, low water and nutrient holding capacities, the very variable nature of the soils over short distances and the fact that much of the site has been disturbed in the past and topsoil removed in parts.

2. METHODS

The location of each soil auger was fixed with a GPS. The soils were described and classified using the South African soil classification (Soil Classification Working Group, 2018). These soil auger locations were then overlayed on the satellite imagery, and the soil information used to delineate the soil boundaries. Features such as clay percentage, soil depth and soil classification are important for the soil unit differentiation. The location of the soil auger points is shown in Figure 4. The location of the soil auger points taken on / in close proximity to the solar facility area is shown in Figure 5 and coordinates are provided.

No soil samples were taken for chemical analyses. Clay percentages were determined by the finger test. Soil alkalinity was tested for each horizon using a 10% solution of HCl.

Figure 1: Location of project area

Figure 2: Location of solar area

3. CLIMATE

The area falls into the warm temperate climate zone with all year rainfall. The rainfall in the area is relatively uniformly spread over the year, illustrated in Figure 2. Mean annual precipitation is 439 mm.

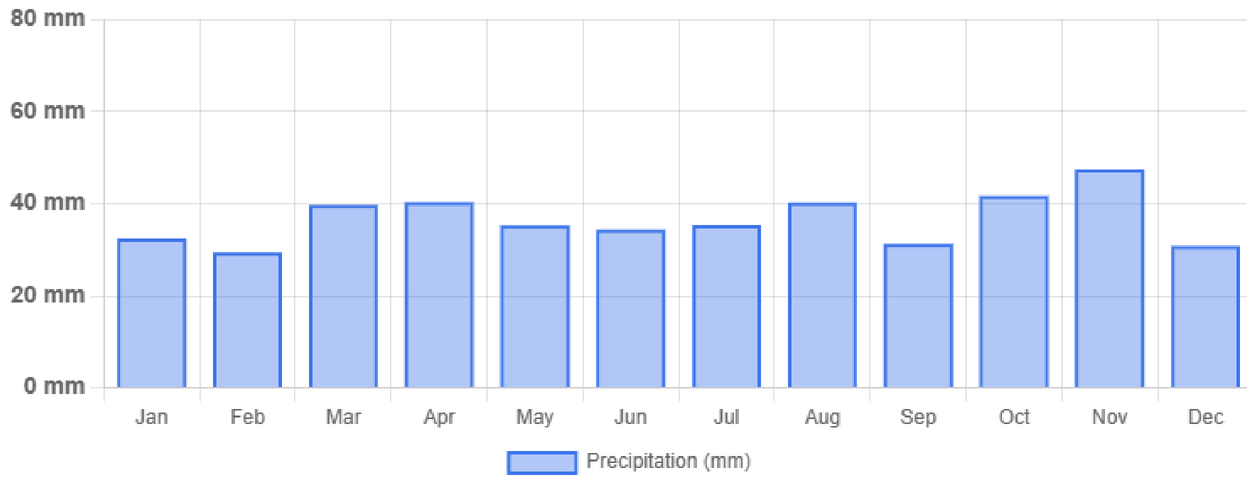

Figure 3: Mean monthly rainfall for Albertinia

5. TERRAIN

The farm portion is located on the Southern Cape Coastal Platform. The area is level to gently sloping and located at elevations of between 175 and 185 m.a.s.l.

6. GEOLOGY

The geology map indicates that the local area is underlain dominantly by high level terrace gravel, silcrete and ferricrete (map symbol Tg), as well as sandstone and argillaceous sandstone (Db) and remnants of windblown sands (Q; Geological Survey, 1991). These geological symbols are referenced in APPENDIX II, the soil observation data base.

7. SOILS

The **soils** are generally shallow, often having been subject to topsoil disturbance in the past. Topsoils are bleached, shallow sands or loamy sands which abruptly overlie ferruginised rock in parts (Ms soil unit), or greyish brown fine sands or loamy sands overlying pale yellow brown sands which abruptly overlie saprolite, hard rock or gleyed clay at depths of 30 to 60 cm (Be, Cf and Kd soil units). Deep wind -blown sands occur to a limited extent (Fw 1 unit) or deep to moderately deep podzolized sands (Ltv and Gk units). All soils have low water holding capacities (WHC), restricted depth or have poor subsoil drainage in parts (Kd unit).

7.1 The following dominant soil types were described in the survey area:

Bethesda form (Be)

ORTHIC A/NEOCUTANIC B/HARD ROCK

A greyish brown apedal sand topsoil overlies a yellowish- brown sandy clay loam which overlies hard rock at 40-60 cm depth. These soils have restricted depth and a moderate water holding capacity (WHC).

Cartref form (Cf)

ORTHIC A/ALBIC E/LITHIC B

A greyish brown apedal, fine sand topsoil overlies a bleached often stony, fine sand which overlies hard or weathered rock.
These soils have a low water and nutrient holding capacity.

Fernwood form (Fw)

ORTHIC A/ALBIC E

A greyish brown, apedal single grain, fine sand topsoil overlies a white, loose fine sand to 150 cm depth. These soils are excessively well drained and have a low nutrient retention and low WHC.

Glenrosa form (Gs)

ORTHIC A/LITHIC B

A dark greyish brown, apedal loose sand topsoil overlies a strong brown to yellowish brown stony loamy sand which overlies hard rock at 40-60 cm depth. Restricted depth and low nutrient and WHC are limitations.

Groenkop form (Gr)

ORTHIC A/PODZOL B/HARD SAPROLITE

A pale grey, apedal, loose sand overlies a brown, apedal, loose loamy sand to 60 cm. These soils have a poor nutrient and WHC.

Kroonstad form (Cg)

ORTHIC A/ ALBIC E/GLEY

A light grey, apedal fine sand topsoil overlies a pale grey or yellow fine sand which abruptly overlies a firm clay subsoil. These soils are poorly drained thus become wet during high rainfall events and set hard during dry periods.

Lamotte form (Lt)

ORTHIC A/ALBIC E / PODZOL B/ SOFT C

A light grey, apedal, loose sand topsoil overlies a white fine sand which overlies a dark brown podzol B loamy sand at depths of 80-100cm. This grades into a mottled yellow brown sand to 150 cm depth.

Mispah form (Ms)

ORTHIC A/HARD ROCK

A light grey sand to loamy sand some 20 to 35 cm deep abruptly overlies hard rock. These soils have a very low potential due to restricted depth and low WHC.

Note: this is the dominant form in the solar facility area.

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8. Soil Map & soil potential

The soil map (Figure 4) shows the location of the soil auger sites (1 – 32) and the distribution of the soil types; the location of the soil auger sites (25 – 32) specific to the solar area is provided in Figure 5 and includes the GPS coordinates of these sites; the legend (Table 1) provides soil data pertaining to the soil types.

The effective rooting depth given in Table 1 relates to depth limiting horizons such as dense sub-soil layers, parent rock/saprolite or stone content.

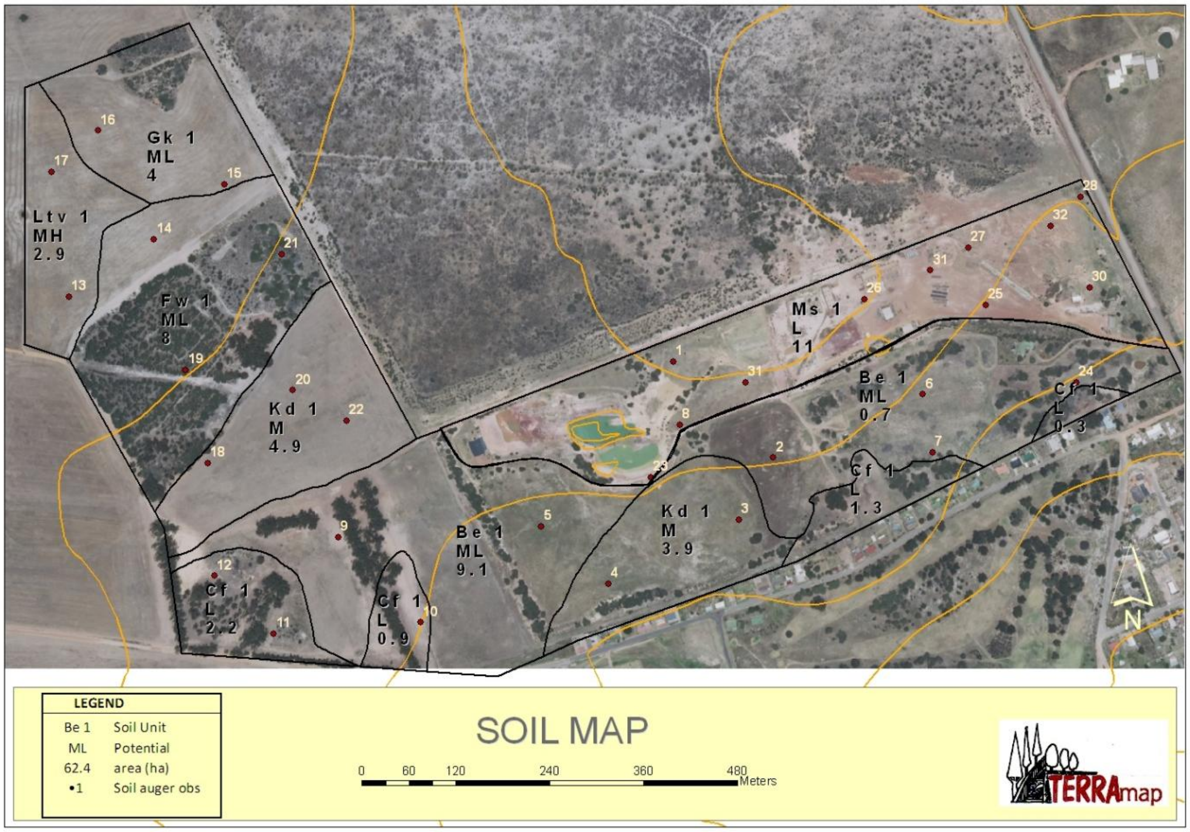

Figure 4: Soil Map showing positions of soil auger sites 1 – 32

Table 1: LEGEND TO SOIL MAP

SOIL UNIT	DOMINANT FORMS & FAMILY	OTHER FORMS	ERD cm*	ARD cm	LIMITATIONS	CLAY % A	CLAY % B	STRUCT A	STRUCT B
Be 1	Bethesda 1112,3112	Cartref 2120 Glenrosa 3120	45-60		Variable soils; Restricted depth; common stone/rock; low WHC	8-12	12-20	a	a-wmb
Cf 1	Cartref 2120	Glenrosa 3120	30-45		Restricted depth; low WHC	6-10	10-15	a	a
Fw 1	Fernwood 2110		150		Low nutrient & WHC	6	5-8	a-sg	a-sg
Gk 1	Groenkop 2120		50-70		Restricted depth; low WHC	6	10-12	a	a
Kd 1	Kroonstad 2110, 2210		50		Restricted depth; fluctuating water table; low WHC	12	50	a	wcb
Lt 1	Lamotte 2112	Fernwood 2110	150	150	Sub-optimal WHC, low nutrient holding.	6-8	15	a	a
Ms 1	Mispah 3120	Katspruit 2110	20-30	30	Restricted depth due to hard rock	6	40	a	a-wmb

SOIL FORM & FAMILY: refer to 'SOIL CLASSIFICATION 2019'.

ERD = effective rooting depth; ARD = ameliorated soil depth; WHC = water holding capacity

STRUC = soil structure: a = apedal; w=weak, m=moderate; f=fine, m=medium; b=blocky, c=crumb

*Saprolite =

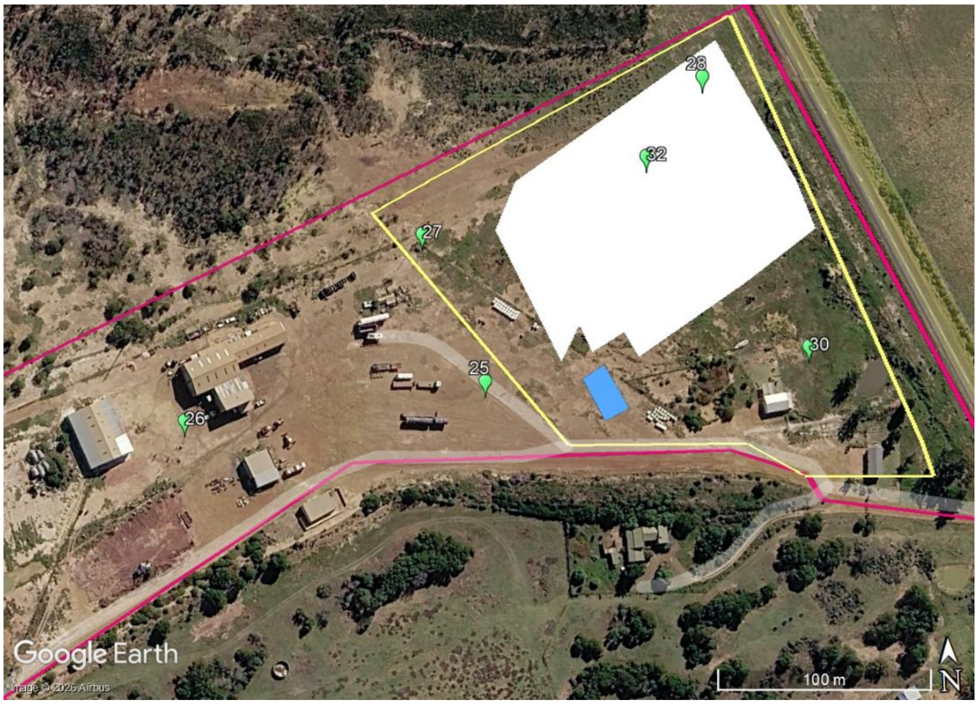

Figure 5: Samples (Soil type MS 1) on / nearby solar facility area

Sample ID	**Coordinates of sample**	
Sample 25 - rock	34°11'49.60"S	21°34'47.92"E
Sample 26 - rock	34°11'49.98"S	21°34'42.41"E
Sample 27 – Ms (Low)	34°11'47.34"S	21°34'46.90"E
Sample 28 – Cf (Low)	34°11'45.17"S	21°34'52.12"E
Sample 30 – Ms (Low)	34°11'49.31"S	21°34'53.85"E
Sample 32 – Ms (Low)	34°11'46.33"S	21°34'51.05"E

Soil Auger descriptions of samples on solar facility area

OBS	FORM	FAMILY	TSD	ESD	ASD	LTN	W	LITH	HOR	DPTH	COL	Clay	SG	CON	STR	STO	PERM
25	Rock																
26	Rock																
27	Ms	3120	10	10	20	R	0		A R	10	GB	6	f	1	a	3sg	s
28	Cf	2120	30	30	50	R	0		A	10	GB	6	f	1	a	2s	r

29	**Cf**	2120	40	35	35	R	0	A	15	GB	6	f	1	a	3sg	r
								E	25	GB	6	f	1	a	4sg	r
								R								
30	**Ms**	3120	25	25	25	R	0	A	25	VDGB	5		1	a	2g	r
31	**Rock**															
32	**Ms**	3120	35	35	35	R	0	A	35	GB	7		1	a	3s	r
								R								

Solar facility area

A portion of the land (soil unit Ms 1) has had all topsoil removed. The solar installation area is located on an area which has had all topsoil removed in the past; the original soil cover was a thin to moderately deep sand or stony, loamy sand. Consequently this portion of the land is essentially underlain by hard rock with only minimal soil coverage in parts.

This soil has a low potential due to its restricted depth, low water and nutrient holding capacities.

This area was never used for any type of cropping due to its low inherent fertility and very low potential; the area has been used as part of a brick making facility for the past 50 years. (pers.comm. land owner Marthinus Jacobus La Grange).

The agricultural potential of the solar faciity area is verified as low. There are no agriculturally sensitive areas identified on the site and there are no developmental limits identified on the solar facility area. The area has already been modified and considered to be suitable for the location of the solar facility.

Photo 1: Photo showing soils in the solar facility area

Agricultural Potential of surveyed area

Soil potential is determined by physical characteristics of the soils such as depth to limiting layers, texture and structure, which all effect soil water holding capacity and drainage. Soil potential was assessed for irrigated pastures. **Figure 6** indicates a general soil potential for dryland crops; **Table 2** provides a suggested potential for canola, maize and wheat. The soils have been rated from moderately high to low. Soil units were downgraded due to restricted depth, low WHC and poor retention of nutrients.
The soil units have also been rated using the international **land capability classification** (LCC). The classes indicate the most intensive tillage that can be practiced safely with permanent maintenance of the soil (McRae and Burnham, 1981). There are 8 classes where classes I-IV are suitable for agriculture. The soil units were rated between I and V.

Soil potential has been assessed for various crops commonly grown in the area. The generalized soil potential ratings shown on the soil potential map assumes dryland cropping while the potential ratings provided in **Table 2** considers irrigation application. Table 2 further provides soil suitability, hazards and suggested soil preparation methods.

This information is recommended to be considered during the planning of the future proposed residential and golf course development with development taking place in areas of low / medium - low potential and the golf course area more suitable to areas of medium / medium-high potential.

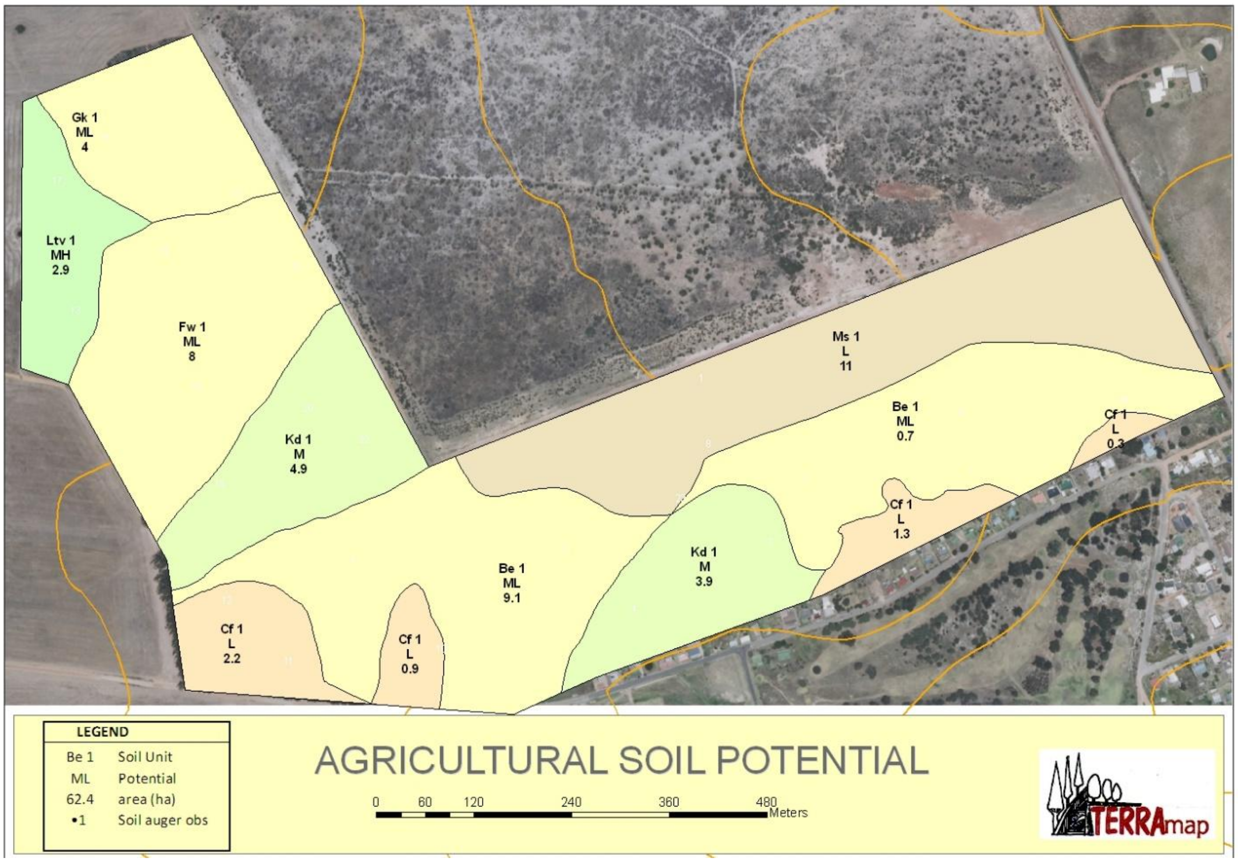

Figure 6: General Agricultural Soil Potential of surveyed area showing Ms1 – low potential mapped on the solar facilities area

Table 2: SOIL POTENTIAL AND HAZARDS

SOIL UNIT	LCC	Irrigation suitability				Soil sensitivity		Soil preparation & amelioration	Area (ha)
		Canola; oats	pasture grasses	Maize/ fodder	wheat	Erosion hazard	Compaction hazard		
Be 1	III	ML	H	ML	ML	ML	H	Conserve & apply mulch	9.8
Cf 1	IV	L	M	L	ML	ML	M	Conserve & apply mulch	4.7
Fw 1	III	ML	MH	ML	MH	M	MH	Conserve & apply mulch	8.0

Gk 1	III	ML	MH	ML	H	M	H	Conserve & apply mulch	4.0
Kd 1	IV	M	MH	M	MH	H	H	Conserve & apply mulch	8.8
Lt 1	II	MH	MH	MH	MH	ML	MH	Conserve & apply mulch	2.9
Ms 1	V	NR	NR	NR	NR	M	ML	Development & conservation area	11.0

LCC = Land Capability Classification NR=Not Recommended

The crop potentials suggested above take into account correct fertilization, irrigation and soil preparation methods. Minimal tillage and crop residue management contribute to satisfactory higher yields on marginal soils. For example, where maize is grown on soils shallower than 120 cm and with higher clay contents than is recommended by the Agricultural Research Council (du Plessis, J., 2003).

References:

Soil Classification Working Group. 2018. Soil Classification, a natural and anthropogenic system for South Africa. ARC -Institute for Soil, Climate and Water, Pretoria.

Geological Survey, 1991. 1:250 000 Geological Series; 3324 Port Elizabeth. Pretoria.

Jéan du Plessis, 2003. Maize Production. Compiled by Directorate Agricultural Information Services Department of Agriculture in cooperation with ARC-Grain Crops Institute

McRae S.G. and Burnham C.P. 1981. Land evaluation. Monographs on soil survey. Clarendon Press, Oxford.

Dept. of Agriculture, Forestry and fisheries. Undated. Production guidelines for wheat.

Truswell, J.F. 1977. The Geological evolution of South Africa. Purnell & Sons, Cape Town.

APPENDIX II SOIL OBSERVATION DATA

OBS	FORM	FAMILY	TSD	ESD	ASD	LTN	W	LITH	HOR	DPTH	COL	Clay	SG	CON	STR	STO	PERM
1	Ca	3212	40	40		R	2	Tg	A	10	B	5	f	1	a	0	r
									B1	20	DYB	35	f	3	wmb	0	m
									B2	40	DYB	50	f	2	wcb	0	m
									R								
2	Ms	3120	20	20		R	1	Tg	A	20	DB	12	f	1	a	2s	r
									R	120							
3	Kd	2110	60	30		w;R	2	Tg	A	10	GB	10	f	1	a	0	r
									E	30	GB	10	f	1	a	6sg	r
									G	60	MYB	60	f	3	wcb	0	s
									R								
4	Kd	2110		50		w	2	Tg	A	20	DB	10	f	1	a	0	r
									E	50	CRB	10	f	1	a	0	r
									G	70	CYB	50	f	3	wcb	0	s
									R								
5	Be	1112	60	60		R	0	Tg	A	10	DGB	10	f	1	a	0	r
									B	60	DGB	12	f	1	a	0	r
									HP								
6	Be	1112	60	60		R	0	Tg	A	10	GB	10	f	2	a	0	r
									B	60	YB	12	f	2	a	3g	r
									HP								
7	Be	3112	50	50		R	0	Tg	A	10	GB	60	f	2	wfb	0	m
									B	50	GB	50	f	2	a	0	m

									R								
8	Ka	2110	45	45		w	3	Tg	A	30	GB	60	f	2	wfb	0	m
									B	90	GB	50	f	2	wfb	0	mr
									R	120							
9	Be	3112	50	50		R	0	Tg	A	20	GB	10	f	1	a	3sg	r
									B	50	YB	10	f	1	a	2g	r
									R								
10	Wa	2200	50	50		HP	2	Db	A	20	LG	6	f	1	a	0	r
									B	50	PYB	6	f	1	a	0	r
									HP								
11	Gs	3120	40	20		s,r		Db	A	20	GB	8		1	a	2g	r
									B	40	LG	8		1	a	4sr	r
									R								
12	Gs	3120	45	25		s,r		Db	A	20	PGB	10		1	a	2s	r
									B	45	GB	12		1	a	4sg	r
									R								
13	Lt	2112	150	150	150		1	Q	A	30	PG	6	f	1	a	0	r
									E	75	W	6	f	1	a	0	r
									B	90	DB	8	f	1	a	0	r
									C	150	YB	6	f	1	a	0	r
14	Fw	2110	150	150	150		0	Q	A	20	PG	5	f	1	a	0	r
									E	150	W	5	f	1	a	0	r
15	Gk	2120	60	60	60	R	0	Tg	A	20	GB	5	f	1	a	0	r
									B	60	DYB	10	f	1	a	0	r
									R								
16	Cf	2120	60	60	60	R	0	Db	A	20	GB	6	f	1	a	0	r
									E	60	LG	5	f	1	a	2sr	r
									R								
17	Lt	2112	120	90	90	SL	1	Q	A	30	GB	5	f	1	a	0	r
									E	60	W	5	f	1	a	0	r
									B	90	SB	12	f	1	a	0	r
									SL								
18	Kd	2210	2210	80	60	w	2	Tg	A	20	GB	6	f	1	a	0	r
									E	60	PYB	12	f	1	a	0	r
									B	75	MYB	18	f	1	wcb	0	m
									SL							7sg	
19	Fw	2110	150	150			0	Q	A	20	GB	5	f	1	a	0	r
									E	150	W	5	f	1	a	0	r
20	Kd	2110	50	50		w	2	Tg	A	30	GB	5	f	1	a	0	r
									E	50	LG	5	f	1	a	0	r
									G	80		50	f	3	wcb	1	s
21	Fw	2110	150	150			0	Q	A	20	LG	6	f	1	a	2s	r
									E	150	W	6	f	1	a	0	r
22	Kd	2210	120	80		w	2	Tg	A	20	GB	8	f	1	a	0	r
									E	80	YB	8	f	1	a	0	r
									G	120	MYB	40	f	1	wcb	0	s
23	Ms	3120	20	20		R	0	Tg	A	15	GB	10	f	1		0	r
									R								
24	Cf	2120	50	50		R	1	Tg	A	20	GB	8	f	1	a		r

								E	50	LG	8	f	1	a	4sg	r
25	Rock															
26	Rock															
27	Ms	3120	10	10	20	R	0	A	10	GB	6	f	1	a	3sg	s
								R								
28	Cf	2120	30	30	50	R	0	A	10	GB	6	f	1	a	2s	r
								E	35	GB	6	f	1	a	5sg	r
								R								
29	Cf	2120	40	35	35	R	0	A	15	GB	6	f	1	a	3sg	r
								E	25	GB	6	f	1	a	4sg	r
								R								
30	Ms	3120	25	25	25	R	0	A	25	VDGB	5		1	a	2g	r
31	Rock															
32	Ms	3120	35	35	35	R	0	A	35	GB	7		1	a	3s	r
								R								

KEY TO CODES

OBS	Soil observation No.	
FORM	Soil form	
FAMILY	Family	
TSD	Total soil depth - cm	
ESD	Effective soil depth - cm	
ASD	Ameliorated soil depth - cm	
LTN	Depth limitation	st=stone; str=dense structure; R=hard rock; so=saprolite; w=wetness
W	Wetness class	0=no wetness; 1=occasional 2=often; 3= frequent wetness
LITH	Lithology (Geology)	Tg=silcrete mix Db=Sandstone Q=Aeolian sands
HOR	Horizon (soil layer)	
DPTH	Depth in cm	
COL	Munsell colour	G=grey, B=brown, D=dark, P=pale, L=light, Y=yellow, M=mottled
Clay	clay %	w=white
SG	sand grain	f=fine; m=medium; c=coarse
CON	consistency	1 = soft/friable; 2= slightly firm; 3= firm 4=hard
STR	Structure	sg=single grained; w=weak;m=moderate; s=strong;
		SIZE: f=fine; m=medium; c=coarse TYPE: c=crumb, b=blocky
STO	% stone	5=50%; s=stone; r=rock; g=gravel
PERM	Permeabilty	r=rapid; m=moderate; s= slow

APPENDIX I   SOME REPRESENTATIVE SOIL FORMS

FERNWOOD FORM 	ORTHIC A ALBIC	**LAMOTTE FORM** 	ORTHIC A ALBIC E PODZOL B C
CARTREF FORM 	ORTHIC A LITHIC sandstone	**LITHIC C/SAPROLITE Sandstone/siltstone** 	**LITHIC C Ferruginised sandstone** 

APPENDIX III SOIL REQUIREMENTS FOR MAIZE & WHEAT

MAIZE PRODUCTION

Jéan du Plessis, 2003. Compiled by Directorate Agricultural Information Services Department of Agriculture in cooperation with ARC-Grain Crops Institute, Pretoria.

The most suitable soil for maize is one with a good effective depth, favourable morphological properties, good internal drainage, an optimal moisture regime, sufficient and balanced quantities of plant nutrients and chemical properties that are favourable specifically for maize production. Although large-scale maize production takes place on soils with a clay content of less than 10 % (sandy soils) or in excess of 30 % (clay and clay-loam soils), the texture classes between 10 and 30 % have air and moisture regimes that are optimal for healthy maize production.

WHEAT PRODUCTION

Wheat requires around 600 mm water p.a. for satisfactory production (*Dept. of Agriculture & Fisheries, undated).* It prefers sandy loam to loamy sand soils (clay content not too high) that are well drained. As the rainfall is considerably lower than the optimal required, wheat should be established under irrigation. Wheat roots usually grow to depths of 1 metre or more, however wheat is successfully grown in shallow duplex soils (viz. Swartland form) in the Western Cape (*Dr Freddy Ellis pers.comm.*). Careful irrigation management of wheat on shallow soils in low rainfall regions is important to optimize yields.

APPENDIX IV: DECLARATION OF INDEPENDENCE

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments.
Report prepared by: G.N. Schafer (Soil Science 400081/03)

I, **Gavin Schafer** 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 environmental impact assessments, 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 will take into account, to the extent possible, the matters listed in regulation 8 of the regulations when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence and is punishable in terms of section 24F of the Act.
- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Amendments to Environmental Impact Assessment Regulations, 2014 as amended.

Signed:............ Date:...30... 7. 2026

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Gavin Nicholas Schafer

Registration Number: 400081/03

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Soil Science (Professional Natural Scientist)

Effective **15 May 2003** Expires **31 March 2027**

President of Council

Chief Executive Officer

To verify this certificate scan this code