Soil and Agricultural Assessment Report for the proposed Naos Solar Project Two & Grid Connection

Viljoenskroon, Free State Province

August 2022

CLIENT

SOLA

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Report Name	**Soil and Agricultural Assessment Report for the proposed Naos Solar Project Two & Grid Connection**	
Reference	**Naos Solar PV Project Two and Grid Connection**	
Submitted to	SOLA	
Field Work	**Michael Douglas**	
	Michael Douglas is a soil scientist with experience in soil classification. Michael completed his BSc Honours in environmental science and geological science at the North-West University of Potchefstroom. Michael has been part of various agricultural potential, land capability and pedology studies as part of Environmental Impact Assessments and Basic Assessments.	
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	Matthew Mamera is a Cand. Sci Nat registered (116356) in natural and agricultural sciences recognized in soil science. Matthew is a soil and hydropedology specialist with experience in soil, pedology, hydropedology, water and sanitation management and land contamination and has field experience and numerous peer reviewed scientific publications in international journals. He is a holder of a PhD in soil science, hydropedology, water and sanitation obtained at the University of the Free State, Bloemfontein. Matthew completed his M.Sc. in soil science, hydropedology and water management at the University of Fort Hare, Alice. Matthew is also a member of the Soil Science Society of South Africa (SSSSA).	
Report Writer / Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

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DECLARATION

I, Matthew Mamera, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Matthew Mamera

Soil Pedologist

The Biodiversity Company

August 2022

1 Introduction

The Biodiversity Company (TBC) was appointed by Sola (Pty) Ltd to undertake an agricultural potential assessment for the Environmental Authorisation (EA) process for the proposed Naos Solar PV Project Two and Grid Connection Line Routes. The project area is located approximately 7 km northwest of Renosterrivier, and 11 km north of Vierfontein, in the Free State Province.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the published Government Notices (GN) 320 in terms of NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" (Reporting Criteria).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities and enable informed decision making. This report aims to also present and discuss the findings from the soil resources identified within the regulated 50 m area, the soil suitability and land potential of these soils, the land uses within the regulated area and also the risk associated with the proposed project.

1.1 Project description

The key components of the proposed projects are described below as per the Environamics (2022) technical information:

- PV Panel Array - To produce up to 200MW, each proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility.
- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.59ha. It must be noted that should the facility layout not require the development and operation of a BESS, the area allocated for the placement of the BESS will be used for panel placement within the development footprint.
- Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse-width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 132kV will also be required.

The onsite substation will be required on each site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 400kV Mercury Main Transmission Substation (MTS).

The project includes two collector substation alternative locations that must be assessed, and the preferred location indicated. The developer has also indicated specific internal power lines to connect the collector substation to the main grid connection corridor which will ultimately evacuate the generated power into the national grid. Should the three developments (i.e., Naos Solar PV Project One, Two and

Three) all be developed then there would be an overlap of the internal 132kV power lines that will be shared between the facilities to reduce the extent of linear infrastructure required).

It must be noted that for each respective project Collector Substation Option 1 is put forward as the technically preferred option for the respective project layouts.

The capacity of the collector substation for each project will be 132kV and the capacity of the internal power lines will be 132kV.

- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on the sites for each project:
  - Operations & Maintenance Building / Office ~2500m²;
  - Switch gear and relay room (~800m²);
  - Staff lockers and changing room (~200m²);
  - Security control (~60m²);
  - Permanent Laydown Area ~8ha (Naos 3); and
  - Temporary batching plant
- Roads – Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. Four alternative main access routes are being considered (the preferred route will be determined by the local and / or national roads authorities during the site access permit approval process). An internal site road network will also be required to provide access to each respective solar field and associated infrastructure. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide and 6km long.
- Fencing - For health, safety and security reasons, the facilities will be required to be fenced off from the surrounding farms. Each project will have permanent security on site for 24hrs per day, 7 days a week.

2 Project Area

The proposed Naos Solar PV Project Two Solar Photovoltaic project and the power Grid connection will be located approximately 7 km southeast of Renosterrivier, and 11 km north of Orkney town in the Free State Province of South Africa (see Figure 2-1). The focus area stretches along the Vaal River. The area is also found approximately 13 km southwest of the Buffelsfontein village and 13 km south of Khuma town. The project area is situated approximately 10 km southwest of the R502 road; 10 km west of the R30 road and 17 km east of the R76 road. The surrounding land use includes watercourses, agricultural activities (Crop and livestock), game farms and mining.

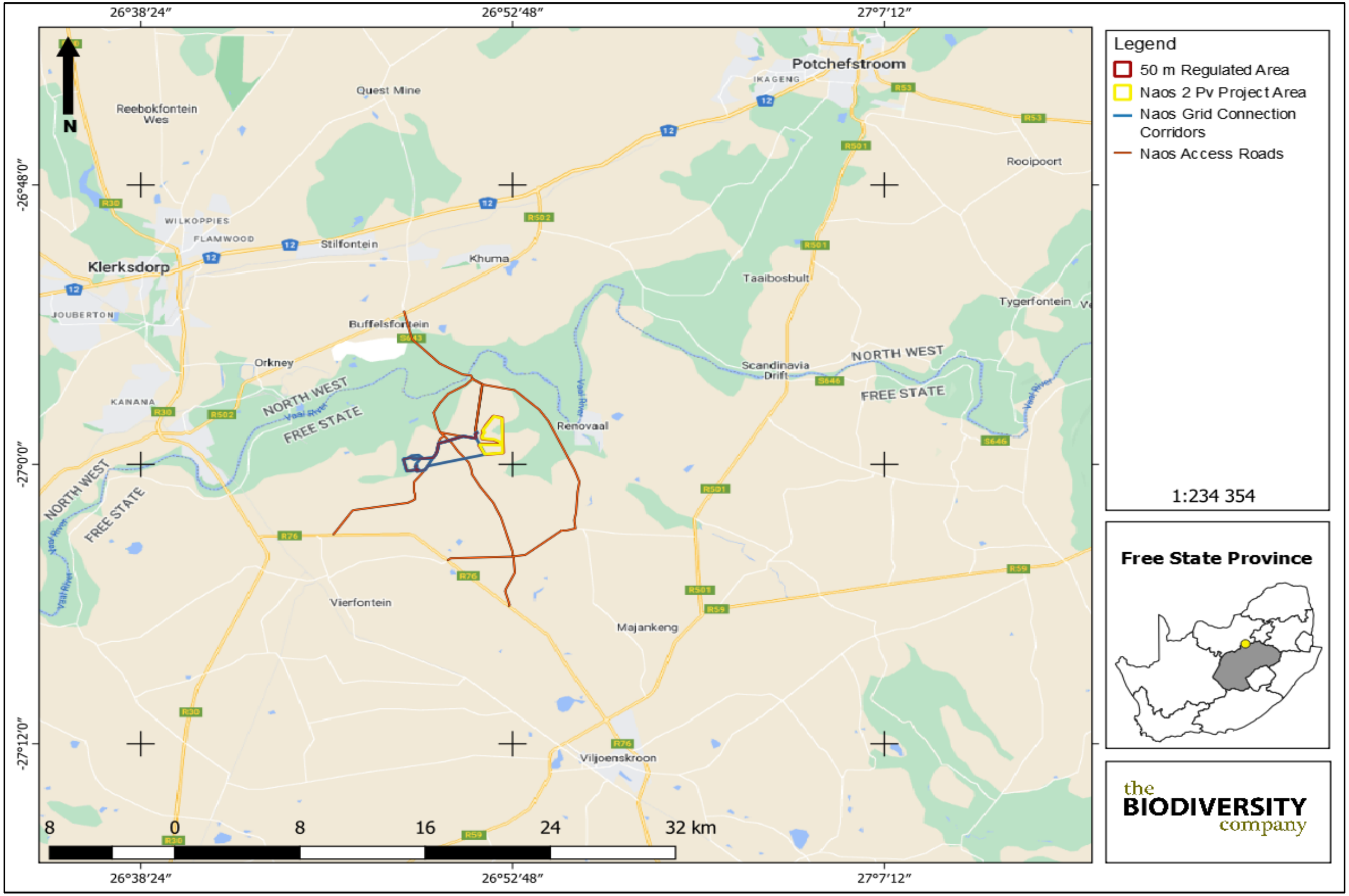

Figure 2-1 The location of the project area

Figure 2-2 Project infrastructure layout

2.1 Scope of Work

According to the National Web based Environmental Screening Tool, the proposed development is located within a "High" sensitivity land capability area. The protocols for minimum requirements (DEA, 2020)[1] stipulates that in the event that a proposed development is located within "High" sensitivities, an agricultural EIA statement should be carried out. It is worth noting that according to these protocols, a site inspection was conducted to determine the accuracy of these sensitivities. The site visit was conducted by the specialist on the 24th to 25th March and 1st to 2nd August 2022. After acquiring baseline information pertaining to soil resources within the 50 m regulated areas, it is the specialist's opinion that the soil forms and associated land capabilities concur with the sensitivities stated by the screening tool. Therefore, an agricultural EIA statement was compiled. This includes:

- The feasibility of the proposed activities;
- Confirmation about the "Low" and "High" sensitivities;
- The effects that the proposed activities will have on agricultural production in the area;
- A map superimposing the proposed footprint areas, a 50 m regulated area as well as the sensitivities pertaining to the screening tool;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation;
- The specialist's opinion regarding the approval of the proposed activities; and
- Any potential mitigation measures described by the specialist to be included in the EMPr.

3 Expertise of the Specialists

3.1 Andrew Husted

Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field.

3.2 Matthew Mamera

Matthew Mamera is a Cand. Sci Nat registered (116356) in natural and agricultural sciences, recognition in soil science. Matthew is a soil and hydropedology specialist with experience in soil pedology, hydropedology, water and sanitation management and land contamination and has field experience and numerous scientific publications in international peer reviewed journals. Matthew completed his MSc in soil science, hydropedology and water management at the University of Fort Hare, Alice. He is also a holder of a PhD in soil science, hydropedology, water and sanitation obtained at the University of the Free State, Bloemfontein. Matthew is also a member of the Soil Science Society of South Africa (SSSSA).

4 Methodology

4.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and

[1] A site identified by the screening tool as being of 'High" or "Very High" sensitivity for agricultural resources must submit a specialist assessment unless the impact on agricultural resources is from an electricity pylon (item 1.1.2).

Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of QGIS and SAGA software.

4.2 Field Survey

An assessment of the soils present within the project area was conducted during a field survey on the 24th to 25th March and 1st to 2nd August 2022. The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1,5 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the “Soil Classification: A Taxonomic System for South Africa” (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

4.3 Erosion Potential

Erosion has been calculated by means of the Smith (2006) methodology. The steps in calculating the Fb2 ratings relevant to erosion potential is illustrated in Table 4-1 with the final erosion classes illustrated in Table 4-2.

Table 4-1 Fb ratings relevant to the calculating of erosion potential (Smith, 2006)

Step 1- Initial value, texture of topsoil horizon				
Light (0-15% clay)		**Medium (15-35% clay)**		**Heavy (>35% clay)**
Fine sand	Medium/coarse sand	Fine Sand	Medium/coarse sand	All sands
3.5	4.0	4.5	5.0	6.0
Step 2- Adjustment value (permeability of subsoil)				
Slightly restricted		Moderately restricted		Heavily restricted
-0.5		-1.0		-2.0
Step 3- Degree of leaching (excluding bottomlands)				
Dystrophic soils, medium and heavy textures		Mesotrophic soils		Eutrophic or calcareous soils, medium and heavy textures
+0.5		0		-0.5
Step 4- Organic Matter				
Organic topsoil			Humic Topsoil	
+0.5			+0.5	
Step 5- Topsoil limitations				
Surface crusting			Excessive sand/high swell-shrink/self-mulching	
-0.5			-0.5	
Step 6- Effective soil depth				
Very shallow (<250 mm)			Shallow (250-500 mm)	
-1.0			-0.5	

[2] The soil erodibility index

Table 4-2 Final erosion potential class

Erodibility	Fb Rating (from calculation)
Very Low	>6.0
Low	5.0 - 5.5
Moderate	3.5 – 4.5
High	2.5 – 3.0
Very High	<3.0

4.4 Land Capability

Given the nature of the assessment statement and the fact that baseline findings correlate with the screening tool's sensitivities, land capability was solely determined by means of the National Land Capability Evaluation Raster Data Layer (DAFF, 2017). Land capability and land potential will also briefly be calculated to match that of the screening tool to ultimately determine the accuracy of the land capability sensitivity from (DAFF, 2017).

Land capability and agricultural potential will briefly be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes, and these may be divided into three capability groups. Table 4-3 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

Table 4-3 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use								Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		MG - Moderate Grazing			MC - Moderate Cultivation					
F- Forestry		IG - Intensive Grazing			IC - Intensive Cultivation					
LG - Light Grazing		LC - Light Cultivation			VIC - Very Intensive Cultivation					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-4. The final land potential results are then described in Table 4-5.

Table 4-4 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	C2	C3	C4	C5	C6	C7	C8
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-5 The Land Potential Classes.

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

4.5 Limitations

- The information contained in this report is based on auger points taken and observations on site. There may be variations in terms of the delineation of the soil forms across the area;
- The GPS used for delineations is accurate to within five meters. Therefore, the delineation plotted digitally may be offset by at least five meters to either side.

5 Project Area

5.1 Climate

The project area is characterised by summer rainfall with very dry winters. According to Mucina & Rutherford (2006), the mean annual precipitation (MAP) is at 530 mm over- all. There is severe frost that occurs in winter and high temperatures in summertime (see Figure 5-1).

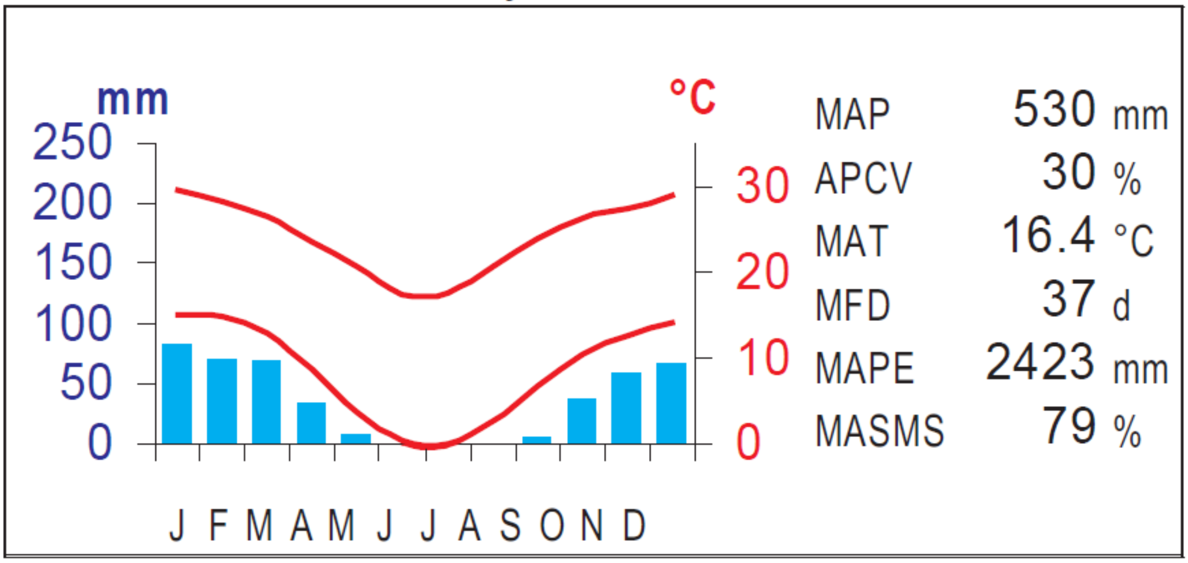

Figure 5-1 **Climate diagram for the region (Mucina & Rutherford, 2006).**

5.2 Soil and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Bc 25 and Bd 13 land types. The Bc land type is characterised with Hutton, Rensburg, Willowbrook and Mispah soil forms according to the Soil classification working group, (1991), with other associated soil forms and rocky areas also occuring in the terrains. The Bd 13 land type is commonly dominated with Clovelly, Avalon, Kroonstad, Katspruit and Willowbrook soil forms within the terrain landscapes. The Bc and Bb land types are characterised by plinthic catena with upland duplex and margalitic soils being rare within the terrain. The terrains are characterised by eutrophic soil base status. In the Bc land types, red soils are widespread and in the Bd land types they are limited. The land terrain units for the featured Bc 25 land type are illustrated in Figure 5-2 with the expected soils listed in Table 5-1; the Bd 13 land types are illustrated in Figure 5-3 and the soils are shown in Table 5-2 .

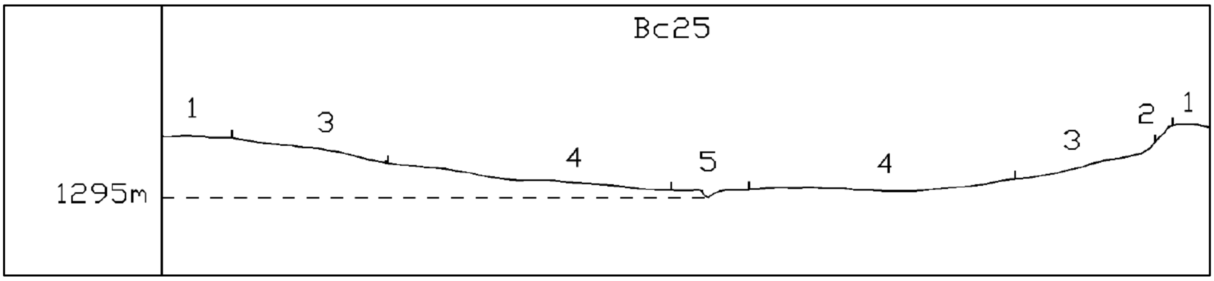

Figure 5-2 Illustration of land type Bc 25 terrain unit (Land Type Survey Staff, 1972 - 2006)

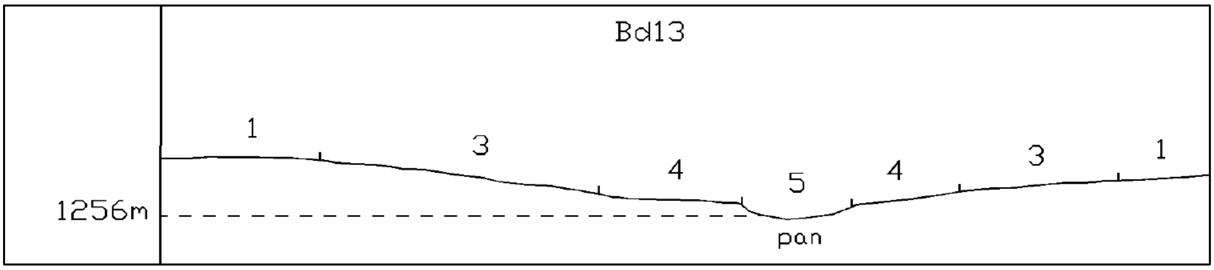

Figure 5-3 Illustration of land type Bd 13 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 5-1 Soils expected at the respective terrain units within the Bc 25 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units									
1 (10%)		**2 (1%)**		**3 (29%)**		**4 (55%)**		**5 (5%)**	
Mispah	50%	Bare Rocks	70%	Hutton	45%	Hutton	27%	Rensburg, Willowbrook	86
Bare rocks	45%	Mispah	30%	Mispah	40%	Avalon	13%	Dundee	14
Hutton	5%			Bare Rocks	7%	Acadia	12%		
				Shortlands	3%	Mispah	9%		
				Westleigh	2%	Westleigh	9%		
				Avalon	2%	Clovelly	4%		
				Clovelly	1%	Bare Rocks	2%		
						Bonheim	2%		
						Shortlands	1%		

Table 5-2 Soils expected at the respective terrain units within the Bd 13 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (25%)		**3 (60%)**		**4 (11%)**		**5 (4%)**	
Clovelly	48%	Avalon	60%	Kroonstad	27%	Katspruit, Willowbrook	70%
Hutton	37%	Glencoe	13%	Longlands	25%	Sterkspruit	10%
Bare rocks	6%	Longlands	10%	Sterkspruit	22%	Oakleaf	10%
Avalon	5%	Kroonstad	7%	Bare Rocks	9%	Bare Rocks	9%
Glenrosa	4%	Bare Rocks	6%	Oakleaf	9%	Glenrosa	1%
		Glenrosa	3%	Glenrosa	5%	Clovelly	4%
		Clovelly	1%	Avalon	3%		

5.3 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 5-4. Most of the project area is characterised by a slope percentage between 0 and 6%, with some smaller patches within the project area characterised by a slope percentage ranging from 7 to 11%. This illustration indicates a few irregularities in the topography in scattered areas the majority of the area being characterised by a gentle slope. The DEM of the project area (Figure 5-5) indicates an elevation of 1 326 to 1 394 Metres Above Sea Level (MASL).

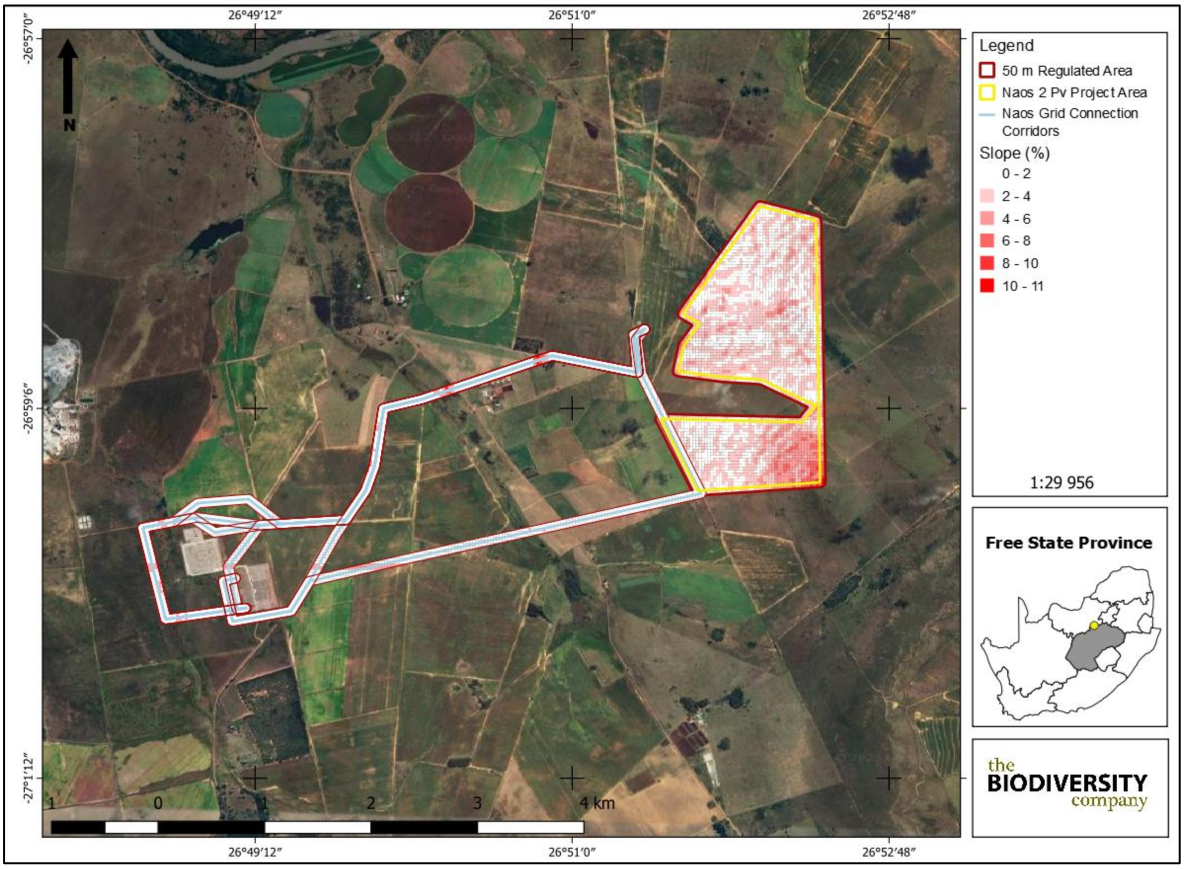

Figure 5-4 The slope percentage calculated for the project area

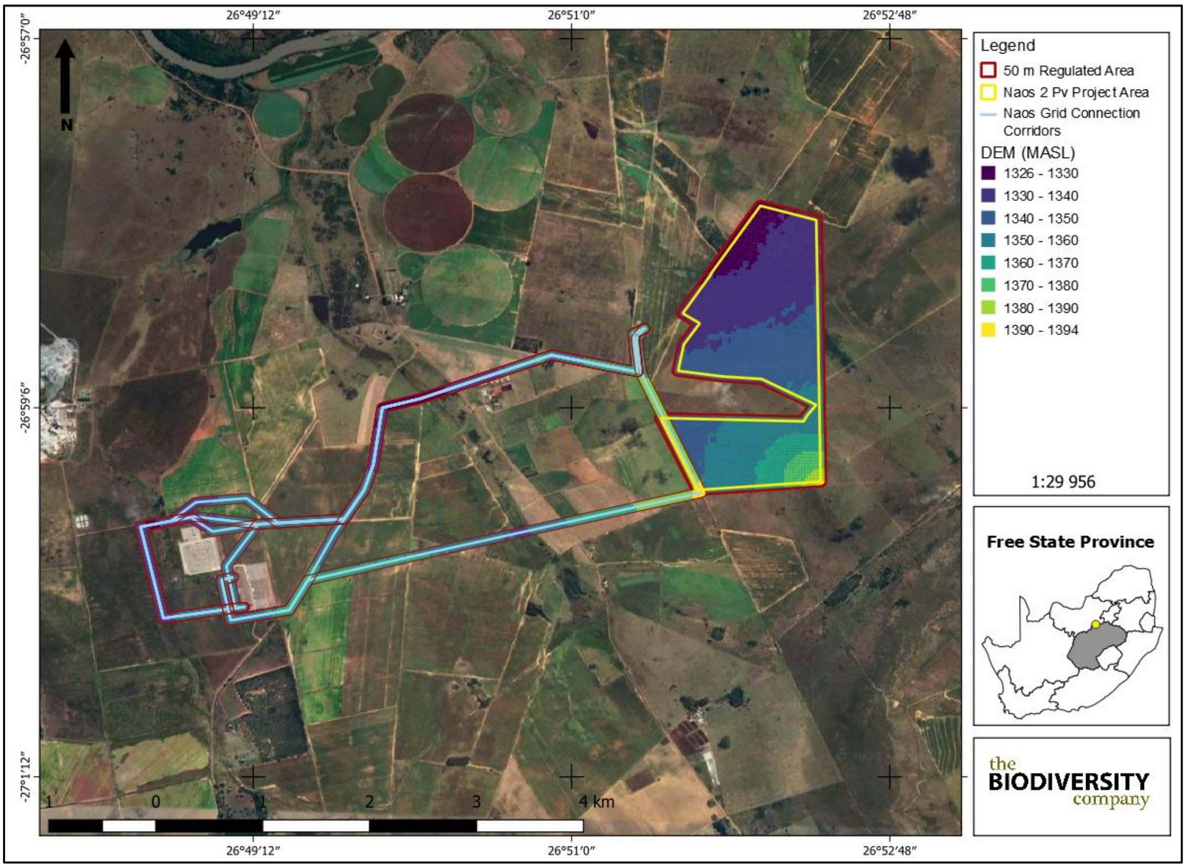

Figure 5-5 The DEM generated for the project area

6 Results and Discussion

6.1 Description of Soil Profiles and Diagnostic Horizons

Soil profiles were studied up to a depth of 1.2 m to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. The most sensitive soil forms have been considered. The following diagnostic horizons were identified during the site assessment (also see Figure 6-1):

- Orthic topsoil;
- Lithic horizon;
- Hard rock horizon;
- Yellow-Brown apedal;
- Albic horizon;
- Soft plinthic horizon; and
- Gley horizon.

6.1.1 Orthic Topsoil

Orthic topsoil are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one Orthic A topsoil to another (i.e., colouration, structure etc) (Soil Classification Working Group, 2018).

6.1.2 Yellow-Brown Apedal Horizon

The yellow-brown apedal horizon is similar to that of the Red Apedal horizon in all aspects except for the colour and the iron-oxide processes involved with the colouration thereof. This diagnostic soil horizon rarely occurs in parent rock high in iron-oxides and will rather be associated with Quartzite, Sandstone, Shale and Granites.

6.1.3 Albic horizon

Albic horizons are characterised with uniform colours due to the dominance of grey to whitish colouration of clay particles. These colours form because of the exposed quartz particles that usually range from a whitish to pale yellow colouration. Albic horizons mostly have a sand to sandy loam texture. Some can also have the occurrence of sandy clay loam and finer textures. The prominent characteristic of an albic horizon is the soil matrix bleaching. This feature occurs due to the redox and ferrolysis chemical reactions, due to eluviation and in instances from podzolization. This horizon has been traditionally identified by a loss of colloidal material, silicate clay, sesquioxide and humus with low clay contents. Most albic horizons have more clay contents than the overlying topsoil horizons. Albic horizons can also occur at deeper layers and receive lateral flows of water from hillslope water accumulations expected (Soil Classification Working Group, 1991).

6.1.4 Soft Plinthic Horizon

The accumulations of iron (and in some cases manganese) as hydroxides and oxides with the presence of high chroma striations and concretions with black matrixes are associated with the Soft Plinthic horizon. This diagnostic horizon forms due to fluctuating levels of saturation. The iron and manganese concentration result in soft marks within the soil matrix which transform in concretions with high consistencies (Soil Classification Working Group, 1991).

If this process continues for long enough periods, a massive continuous impermeable layer of hard plinthite forms. A Soft Plinthic horizon and a Hard Plinthic horizon can be distinguished from one another by means of a simple spade test. A Soft Plinthic horizon can be penetrated by means of a spade in wet conditions whereas a Hard Plinthic horizon cannot (Soil Classification Working Group, 1991).

According to Soil Classification Working Group (2018), this horizon commonly occurs as a result of hillslope hydrology in flat, sandy landscapes. This horizon is known to have an apedal structure together with the presence of concretions.

6.1.5 Gley Horizon

Gley horizons are well developed and have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a Gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a gley horizon. The structure of a gley horizon mostly is characterised as strong apedal, with low hydraulic conductivities and a clay texture, although sandy gley horizons are known to occur. The gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths (Soil Classification Working Group, 2018).

6.1.6 Lithic horizon

A lithic horizon is a subsurface horizon with morphological expression of pedogenic alteration that range from strong weathering of the underlying country rock, with friable soil-like structure. The soil material is intimately mixed with partially weathered to hard rock fragments. Evidence of gleying in the form of reduction of iron minerals in the soil matrix or in the partially weathered fragments may be present in the wetter variants. However, redo-morphological properties are absent in drier conditions.

6.1.7 Hard Rock Horizon

Hard rock horizon comprises of hard rock characterised with primarily physical weathering ranging from fractured and solid rock lacking soil development between the fractures. The underlain parent material includes igneous, sedimentary and metamorphic rocks. The horizon restricts most root penetrations of plants except for some selected annual trees and shrubs which can grow through the fractured sections in specialized ecological niche environments.

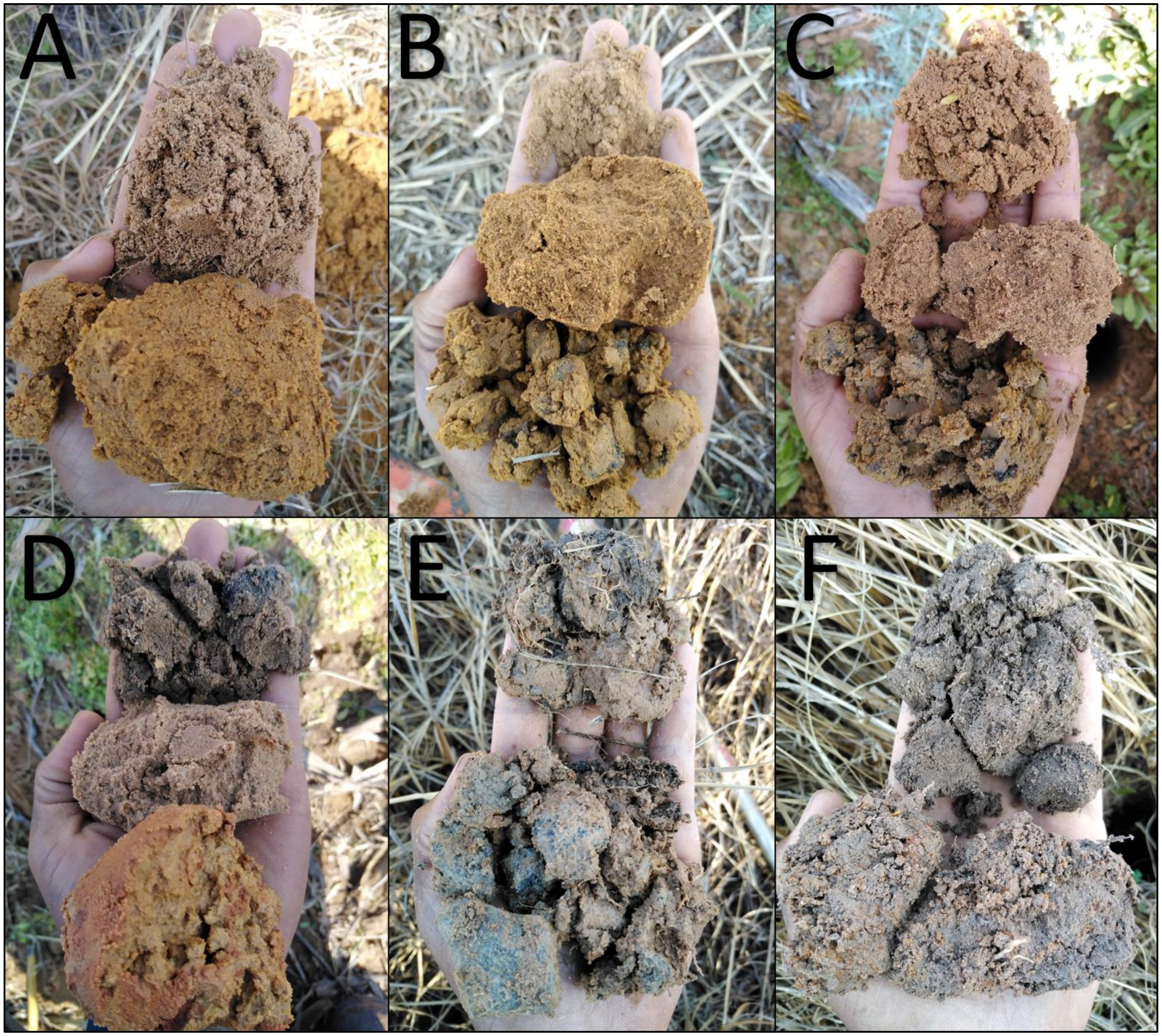

Figure 6-1 Dominant soils identified during the site assessment. A) Orthic topsoil with a Yellow-Brown apedal horizon below. B) Lithic below Yellow-brown apedal horizon C) Soft plinthic horizon). E) Lithic subsurface horizon. F) and D) Gleyic horizons

6.2 Description of Soil Forms and Soil Families

During the site assessment various soil forms were identified. These soil forms are described in Table 6-1 according to depth, clay percentage, indications of surface crusting, signs of wetness and percentage rock. The soil forms are followed by the soil family and in brackets the maximum clay percentage of the topsoil. Soil family characteristics are described in Table 6.2.

Table 6-1 Summary of soils identified within the project area

	Topsoil					Subsoil B1				Subsoil B2			
	Depth (mm)	Clay (%)	Signs of wetness	Rock %	Surface crusting	Depth (mm)	Clay (%)	Signs of wetness	Rock %	Depth (mm)	Clay (%)	Signs of wetness	Rock %
Ermelo 1220(15)	0-300	0-15	None	0	None	300-1200	15-30	None	2				
Clovelly 1221(15)	0-300	0-15	None	0	None	300-900	15-30	None	3	900-1200	15-30		40
Avalon 1220(15)	0-250	0-15	None	0	None	250-350	15-35	None	0	350-450	15-30	Plinthic	30
Carolina 1221(15)	0-300	0-15	None	0	None	300- 600	0-15	None	0	+ 600	N/A	N/A	60+
Kransfontein 1220 (15)	0-250	0-15	None	0	None	250- 450	0-15	None	0	450-500	15-30	Present/Bleached	0
Pinedene 1220 (15)	0-300	0-15	None	0	None	300-650	15-30	None	0	650-700	15-30	Present/Mottles	2
Katspruit 1120(15)	0-150	0-15	None	0	None	150-300	15-30	Present	5	-	-		
Glenrosa 1110 (15)	0-30	0-15	None	5	None	30-100	0-15	None	30	100+	-	-	60+
Mispah 1110 (15)	0-50	0-15	Present	0	None	50-600+	-	-	60+	600+	-	-	60+

Table 6-2 Description of soil family characteristics

Soil Form/Family	Topsoil Colour	Base Status	Textural Contrast
Ermelo 1220 (15)	Dark Topsoil	Mesotrophic	Luvic
Clovelly 1221 (15)	Dark Topsoil	Mesotrophic	Luvic
Avalon 1220 (15)	Dark Topsoil	Mesotrophic	Luvic
Carolina 1221 (15)	Dark Topsoil	Mesotrophic	Luvic
Kransfontein 1220 (15)	Dark Topsoil	Mesotrophic	Luvic
Pinedene 1220 (15)	Dark Topsoil	Mesotrophic	Luvic
Katspruit 1120(15)	Dark Topsoil	Calcareous	Friable
Glenrosa 1110 (15)	Dark Topsoil	Mesotrophic	Luvic
Mispah 1110 (15)	Dark Topsoil	Dystrophic	Luvic

6.3 Agricultural Potential

Agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions.

The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region.

6.4 Climate Capability

The climatic capability has been determined by means of the Smith (2006) methodology, of which the first step includes determining the climate capability of the region by means of the Mean Annual Precipitation (MAP) and annual Class A pan (potential evaporation) (see Table 6-3).

Table 6-3 Climatic capability (step 1) (Scotney et al., 1987)

		Central Sandy Bushveld region		
Climatic Capability Class	**Limitation Rating**	**Description**	**MAP: Class A pan Class**	**Applicability to site**
C1	None to Slight	Local climate is favourable for good yields for a wide range of adapted crops throughout the year.	0.75-1.00	
C2	Slight	Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperature increase risk and decrease yields relative to C1.	0.50-0.75	
C3	Slight to Moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.	0.47-0.50	
C4	Moderate	Moderately restricted growing season due to the occurrence of low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.	0.44-0.47	
C5	Moderate to Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss.	0.41-0.44	
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss.	0.38-0.41	
C7	Severe to Very Severe	Severely restricted choice of crops due to heat and moisture stress.	0.34-0.38	
C8	Very Severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.	0.30-0.34	✓

According to Smith (2006), the climatic capability of a region is only refined past the first step if the climatic capability which is determined to be between climatic capability 1 and 6. Given the fact that the climatic capability has been determined to be “C8” for the project area, no further steps will be taken to refine the climate capability.

6.5 Land Capability

The land capability was determined by using the guidelines described in "The farming handbook" (Smith, 2006). The delineated soil forms were clipped into the four different slope classes (0-3%, 3-7%, 7-12% and >12%) to determine the land capability of each soil form. Accordingly, the most sensitive soil forms associated with the project area are restricted to land capability 3 and 4 classes.

Table 6-4 Land capability for the soils within the project area

Land Capability Class	Definition of Class	Conservation Need	Use-Suitability	Land Capability Group	Sensitivity
3	Moderate limitations. Some erosion hazard	Special conservation practice and tillage methods	Rotation crops and ley (50%)	Arable	High
4	Severe limitations. Low arable potential.	Intensive conservation practice	Long term leys (75%)	Arable	Moderate

6.6 Land Potential

The methodology in regard to the calculations of the relevant land potential levels are illustrated in Table 6-5 and Table 6-6. From the two land capability classes, the land potential levels have been determined by means of the Guy and Smith (1998) methodology. Land capability III and IV have been reduced to a land potential level L6 due to climatic limitations.

Table 6-5 Land potential from climate capability vs land capability (Guy and Smith, 1998)

Land Capability Class	Climatic Capability Class							
	C1	C2	C3	C4	C5	C6	C7	C8
LC1	L1	L1	L2	L2	L3	L3	L4	L4
LC2	L1	L2	L2	L3	L3	L4	L4	L5
LC3	L2	L2	L2	L2	L4	L4	L5*	L6*
LC4	L2	L3	L3	L4	L4	L5	L5*	L6*
LC5	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
LC6	L4	L4	L5	L5	L5	L6	L6	L7
LC7	L5	L5	L6	L6	L7	L7	L7	L8
LC8	L6	L6	L7	L7	L8	L8	L8	L8

*Land potential level applicable to climatic and land capability

Table 6-6 Land potential for the soils within the project area (Guy and Smith, 1998)

Land Potential	Description of Land Potential Class	Sensitivity
6	**Very restricted potential.** Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable.	Low
Vlei	Wetland (grazing and wildlife)	Low
Disturbed	N/A	None

6.7 Erosion Potential

The erosion potential of the identified soil forms has been calculated by means of the (Smith, 2006) methodology. In some cases, none of the parameters are applicable, in which case the step was skipped.

6.7.1 Ermelo

Table 6-8 illustrates the values relevant to the erosion potential of the Ermelo soil forms. The final erosion potential score has been calculated at 4.0, which indicates a "Moderate" potential for erosion.

Table 6-7 Erosion potential calculation for the Ermelo soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		-1.0		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			**Humic Topsoil**	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			**Excessive Sand/High Shrink/Self-Mulching**	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			**Shallow (<250-500 mm)**	
-1.0			-0.5	

6.7.2 Clovelly

Table 6-8 illustrates the values relevant to the erosion potential of the Clovelly soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "Moderate" potential for erosion.

Table 6-8 Erosion potential calculation for the Clovelly soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		-1.0		-2.0

Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	<u>0</u>	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

6.7.3 Avalon

Table 6-9 illustrates the values relevant to the erosion potential of the Avalon soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "Moderate" potential for erosion.

Table 6-9 Erosion potential calculation for the Avalon soil forms

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 <u>4.0</u>	4.5 5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	-1.0	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	<u>0</u>	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

6.7.4 Carolina

Table 6-10 illustrates the values relevant to the erosion potential of the Carolina soil forms. The final erosion potential score has been calculated at 4.0, which indicates a "Moderate" potential for erosion.

Table 6-10 Erosion potential calculation for the Carolina soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	**4.0**	4.5	5.0	6.0
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		-1.0		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		**0**		-0.5
Step 4- Organic Matter				
Organic Topsoil			**Humic Topsoil**	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			**Excessive Sand/High Shrink/Self-Mulching**	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			**Shallow (250-500 mm)**	
-1.0			-0.5	

6.7.5 Kransfontein

Table 6-11 illustrates the values relevant to the erosion potential of the Kransfontein soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "Moderate" potential for erosion.

Table 6-11 Erosion potential calculation for the Kransfontein soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		**-1.0**		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		0		-0.5

Step 4- Organic Matter	
Organic Topsoil	**Humic Topsoil**
+0.5	+0.5
Step 5- Topsoil Limitations	
Surface Crusting	**Excessive Sand/High Shrink/Self-Mulching**
-0.5	-0.5
Step 6- Effective Soil Depth	
Very Shallow (<250 mm)	**Shallow (<250-500 mm)**
-1.0	-0.5

6.7.6 Glenrosa

Table 6-12 illustrates the values relevant to the erosion potential of the Glenrosa soil forms. The final erosion potential score has been calculated at 3.0, which indicates a "High" potential for erosion.

Table 6-12 Erosion potential calculation for the Glenrosa soil forms

Step 1- Initial Value, Texture of Topsoil		
Light (0-15% Clay)	**Medium (15-35% Clay)**	**Heavy (>35% Clay)**
3.5 4.0	4.5 5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)		
Slightly Restricted	**Moderately Restricted**	**Heavily Restricted**
-0.5	**-1.0**	-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)		
Dystrophic Soils, Medium and Heavy Textures	**Mesotrophic Soils**	**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5	0	-0.5
Step 4- Organic Matter		
Organic Topsoil		**Humic Topsoil**
+0.5		+0.5
Step 5- Topsoil Limitations		
Surface Crusting		**Excessive Sand/High Shrink/Self-Mulching**
-0.5		-0.5
Step 6- Effective Soil Depth		
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

6.7.7 Mispah

Table 6-13 illustrates the values relevant to the erosion potential of the Mispah soil forms. The final erosion potential score has been calculated at 1.5, which indicates a "Very High" potential for erosion.

Table 6-13 Erosion potential calculation for the Mispah soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		-1.0		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			**Humic Topsoil**	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			**Excessive Sand/High Shrink/Self-Mulching**	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			**Shallow (<250-500 mm)**	
-1.0			-0.5	

6.8 Hydromorphic Soils

6.8.1 Pinedene

Table 6-14 illustrates the values relevant to the erosion potential of the Pinedene soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "Moderate" potential for erosion.

Table 6-14 Erosion potential calculation for the Pinedene soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		**-1.0**		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			**Humic Topsoil**	
+0.5			+0.5	

Step 5- Topsoil Limitations	
Surface Crusting	**Excessive Sand/High Shrink/Self-Mulching**
-0.5	-0.5
Step 6- Effective Soil Depth	
Very Shallow (<250 mm)	**Shallow (<250-500 mm)**
-1.0	-0.5

6.8.2 Katspruit

Table 6-15 illustrates the values relevant to the erosion potential of the Katspruit soil forms. The final erosion potential score has been calculated at 3.0, which indicates a "High" potential for erosion.

Table 6-15 Erosion potential calculation for the Katspruit soil forms

Step 1- Initial Value, Texture of Topsoil				
Light (0-15% Clay)		**Medium (15-35% Clay)**		**Heavy (>35% Clay)**
3.5	4.0	4.5	5.0	**6.0**
Step 2- Adjustment Value (Permeability of Subsoil)				
Slightly Restricted		**Moderately Restricted**		**Heavily Restricted**
-0.5		**-1.0**		-2.0
Step 3- Degree of Leaching (Excluding Bottomlands)				
Dystrophic Soils, Medium and Heavy Textures		**Mesotrophic Soils**		**Eutrophic or Calcareous Soils, Medium and Heavy Textures**
+0.5		0		-0.5
Step 4- Organic Matter				
Organic Topsoil			**Humic Topsoil**	
+0.5			+0.5	
Step 5- Topsoil Limitations				
Surface Crusting			**Excessive Sand/High Shrink/Self-Mulching**	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			**Shallow (<250-500 mm)**	
-1.0			-0.5	

6.9 Sensitivity Verification

The following land potential level has been determined;

- Land potential level 6 (this land potential level is characterised by a very restricted potential**.** Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable).

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which nine potential land capability classes are located within the proposed project area, including;

- Land Capability 1 to 5 (Very Low to Low Sensitivity);
- Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity) and;
- Land Capability 9 to 10 (Moderate High Sensitivity).

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which is predominantly covers “Moderately Low” to “Moderate” sensitivities. Smaller patches are characterised by sensitivities with “Very Low to Low” and “Moderately High” (Figure 6-2).

Furthermore, various crop field boundaries were identified by means of the DEA Screening Tool (2023), which are predominantly characterised by “High” sensitivities. All crop fields identified as "high" sensitivities in Figure 6-3 have not been used by the landowner for several years due to the limited capabilities. These abandoned areas were previously used for maize fields and grazing. The sandy soils observed on site indicated drainage and waterlogging problems which can either be caused by shallow soil profile depths or occurrence of a restrictive substratum layer below. The Land Capability Sensitivity map below (see Figure 6-2) shows that most "crop fields" (now abandoned) are within low to moderate capability sensitivity areas.

It is the specialist`s opinion and recommendation that development can occur on these areas for the project. The productivity and crop feasibility of these areas as determined by an Agricultural Economic Specialist assessment also confirms that they have a low productive potential. Furthermore, since the applicant has obtained consent from the landowners for use of these farm areas, these can be submitted as part of the supporting documents for the application. Thus, no stakeholder engagement will be required for compensation of these crop fields. It is therefore the specialist` recommendation that, the Naos Solar PV Project Two and Grid connection power lines infrastructure be favourably considered as have being planned.

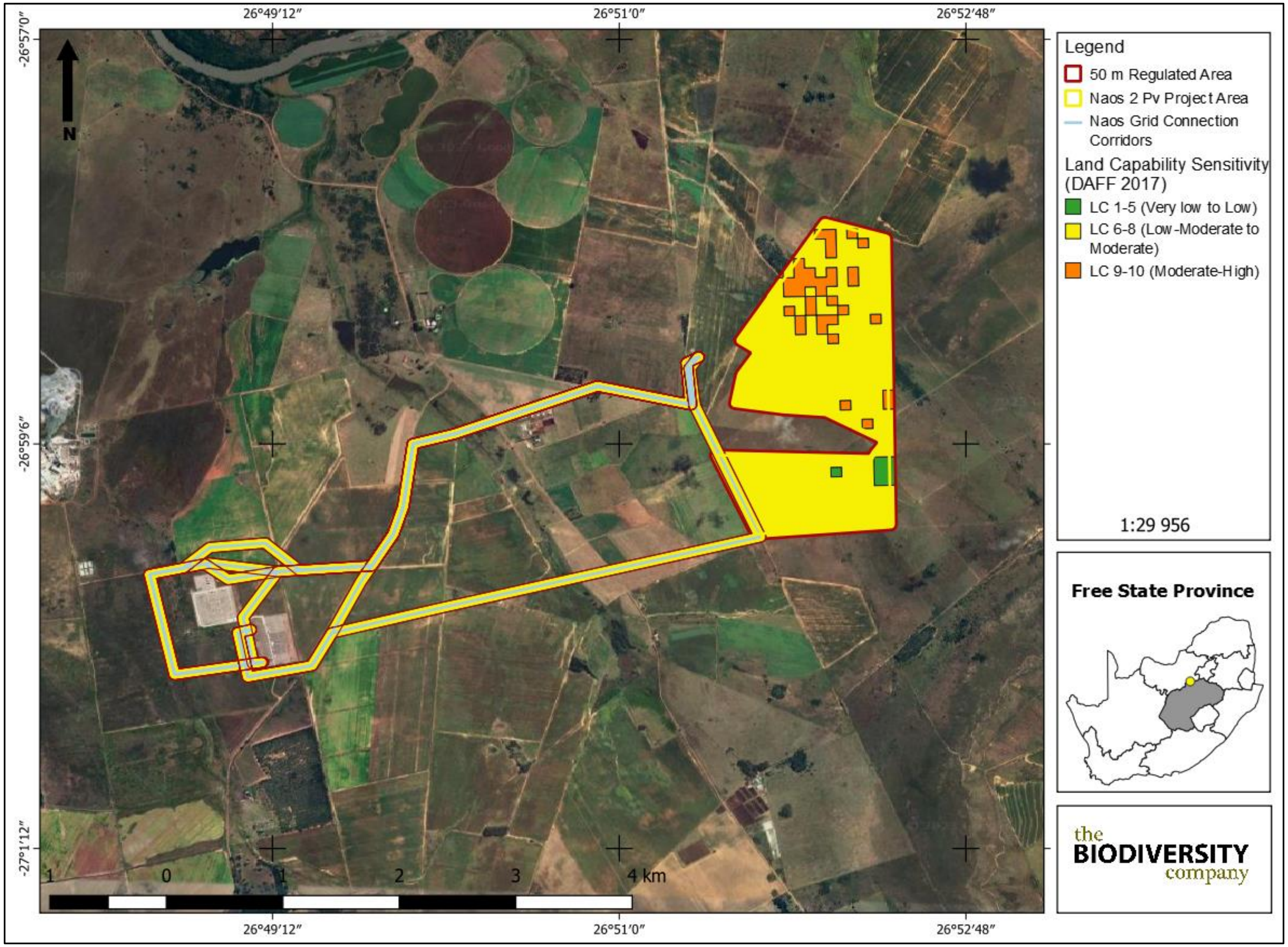

Figure 6-2 The land capability sensitivity (DAFF, 2017)

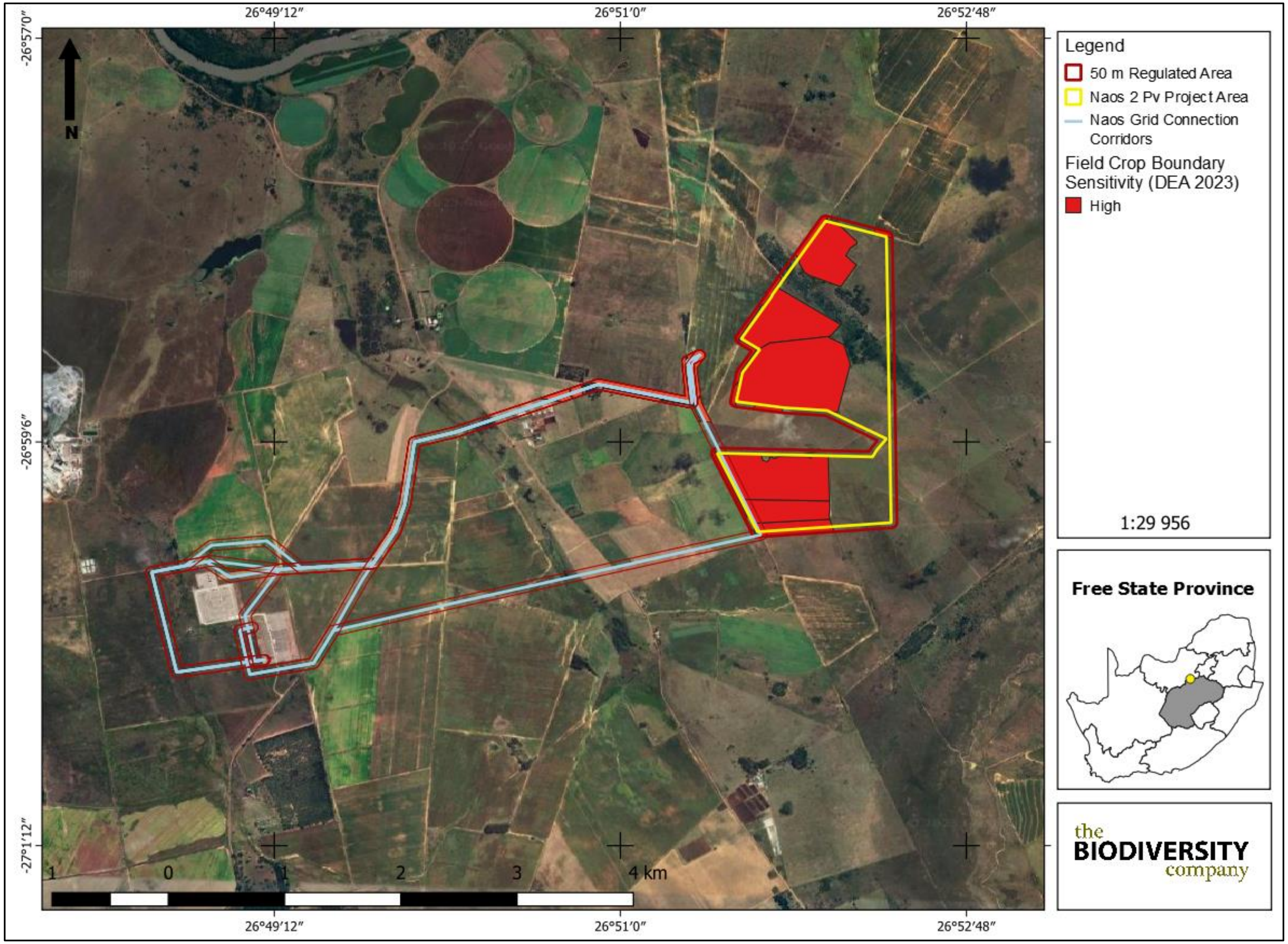

Figure 6-3 Crop boundary sensitivity (DEA Screening Tool, 2023)

7 Impact Assessment

Infrastructure within the project area assigned to the available land includes PV modules and mounting structures, collector substation, transmission loops and access roads. The proposed activities often impede into historical “High” sensitivity crop fields based on the DEA Screening Tool, (2023). Even though these sensitivities are not associated with arable land potential conditions, limited agricultural activities impacts will occur

Impacts were assessed in terms of the construction, operational and decommissioning phases. Mitigation measures were only applied to impacts deemed relevant.

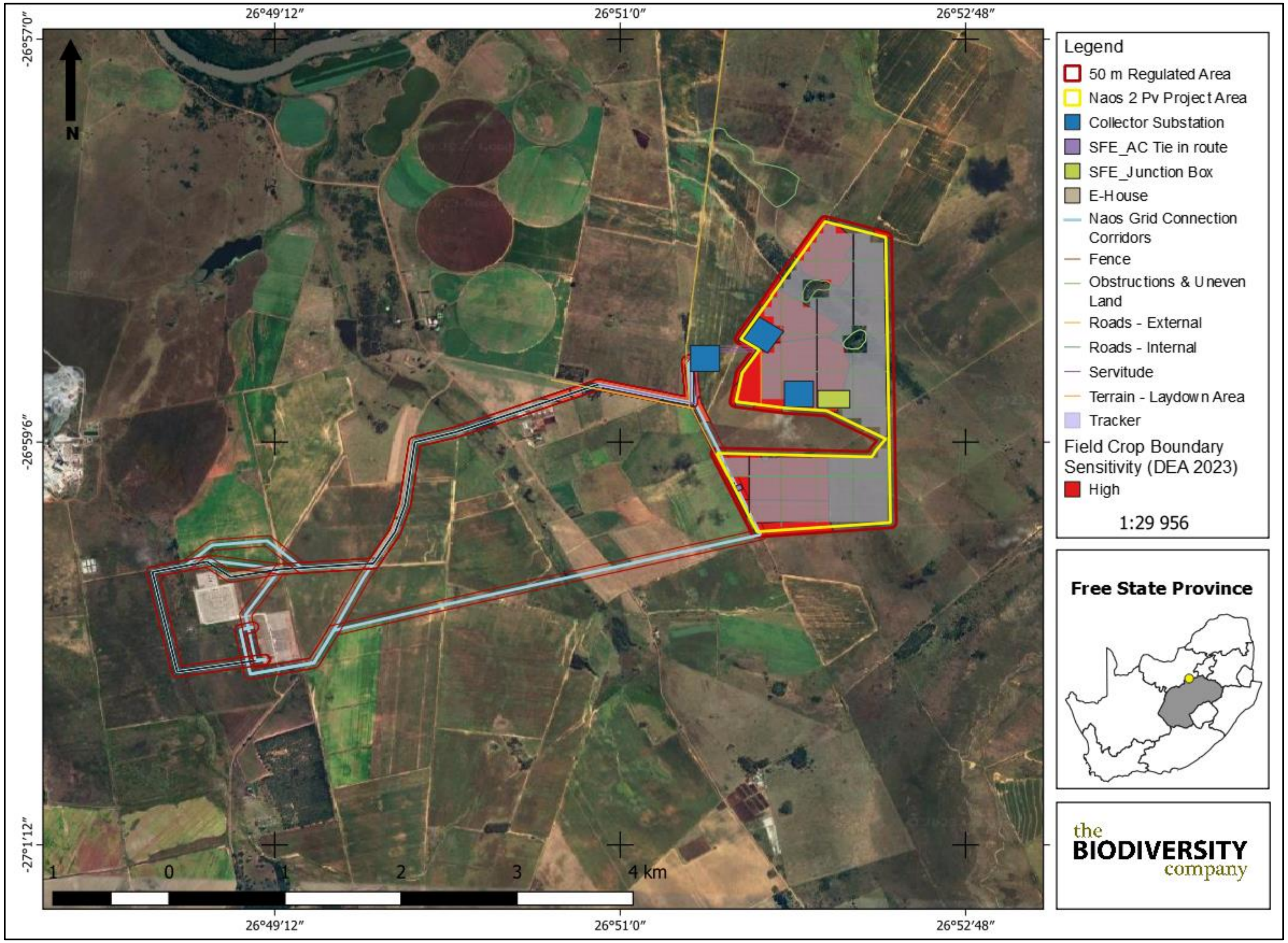

Figure 7-1 Infrastructure within proximity to sensitive crop fields

7.1 Anticipated Activities

The proposed activities associated with the Solar PV renewable project can be seen overlaid with the overall sensitivity (Figure 7-1). The following activities will take place;

- PV modules and mounting structures with a capacity of 200MW and dependent on optimization and cost;
- Inverters and transformers;
- Power line infrastructure
- BESS;
- Cabling between project components;
- Laydown and O&M hub:
    - Construction compound (temporary); and
    - Maintenance office.

7.1.1 Alternatives Considered

Six alternatives grid connections to the existing Mercury MTS substation were considered within the assessment area for the proposed Naos Solar PV project Two (see Figure 7-1). Sections of the proposed servitude 1a; 1b and 1c will intercept with areas characterized as “high” sensitivity crop fields. The most preferable alternative can be servitude option 4 located in less sensitive crop fields.

7.1.2 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management. Table 7-1 is a summary of the findings of an unplanned event assessment from an agricultural potential perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 7-1 Summary of unplanned events for soil and land capability resources

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of soil as well as water resources associated with spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.

7.1.3 Planning Phase Impacts

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include preparations and desktop work in support of waste management plans, environmental and social screening assessments, finalising sites and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward.

7.2 Naos Solar PV Project Two

7.2.1 Construction Phase

The proposed development will result in the stripping of topsoil and alterations to the existing land uses. The changes in the land use will be from agricultural to renewable development (or transformed). The proposed activities will have limited impacts on the historical areas which were characterised as high agricultural production areas (DEA Screening Tool, 2023) with some aspects affecting "Low" to "Moderate" sensitivity areas. It is possible that suitable agricultural land could become fragmented, resulting in these smaller portions no longer being deemed feasible to farm. However, these crop fields have a low economic feasibility potential following an agricultural economics specialist assessment of the land.

During the construction phase, foundations will be cleared with topsoil often being stripped and stockpiled. Access roads will be created with trenches being dug for the installation of relevant cables/pipelines. Construction of substation sites will take place together with the erection of transmission lines where relevant. Contractor and laydown yards will also be cleared with construction material being transported to laydown yards. Potential erosion is expected during the construction phase due to some erodible soils within the assessment area, such as the Glenrosa and Katspruit soil forms. The removal of vegetation and changes to the local topography could result in an alteration to surface run-off dynamics. Erosion of the area could result in further loss of topsoil, and soil forms suitable for agriculture. Soil compaction can also result due to increased traffic on site.

Table 7-2 Impact assessment related to the loss of the land capability during the construction phase of the proposed Naos Solar PV Project Two.

Nature: Loss of land capability		
	Without mitigation	With mitigation
Extent	Moderate (2)	low (2)
Duration	Moderate Term (3)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Low (2)
Significance	Medium (36)	Low (12)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.2.1.1 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Medium – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed inTable 7-8 .

7.2.1 Operational Phase

During the operational phase, limited impacts are foreseen. Concrete areas will be equiped with drains to reduce soil erosion on exposed areas. Only the footprint area will be disturbed to minimise soil and vegetation disturbance of the surrounding area. Revegetation will be carried out on exposed surrounding areas to avoid surface erosion. Maintenace of vegetation and solar PV infrastructure will have to be carried out throughout the life of the project. It is expected that these maintenance practices can be undertaken by means of manual labour.

7.2.1.1 Infrastructure

The operational phase of the renewable project (Constructed Infrastructure) includes anthropogenic movement and activities. The relevant infrastructure will be occupied by professionals throughout the lifetime of the operation. Besides compaction and erosion caused by increased traffic and surface water run-off for the area, few aspects are expected to be associated with this phase. The spread of alien invasive species will be a risk, predominantly adjacent to developed aeras (edge effect).

Table 7-3 Impact assessment related to the loss of land capability during the operational phase of the proposed Naos Solar PV Project Two.

Nature: Loss of land capability		
	Without mitigation	With mitigation
Extent	low (2)	Very low (1)
Duration	Short Term (2)	Very short Term (1)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Low (2)
Significance	Low (24)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.2.1.2 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Low – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed in Table 7-8.

7.2.2 Cumulative Impacts

The cumulative impacts have been scored "Low," indicating that the potential incremental, interactive, sequential, and synergistic cumulative impacts. It is probable that the impact will result in spatial and temporal cumulative change.

Table 7-4 Impact assessment related to the loss of land capability due to cumulative impacts of the proposed Naos Solar PV Project Two.

Nature: Loss of land capability		
	Without mitigation	With mitigation
Extent	Low (2)	Very Low (1)
Duration	Moderate term (3)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (10)**

Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.2.2.1 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Low – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed in Table 7-8.

7.3 Grid Connection powerlines

7.3.1 Construction Phase

The proposed grid connection alternatives will have similar activities and effects to the Naos Solar PV Project Two development as per section 7.2.1. Such activities as topsoil stripping, stockpiling, installation of relevant cables and pylons will occur. Some of the alternative connections will be located in areas with high crop sensitivity, even though the effect to the land capability is minimal. Only the disturbed routes/servitude and areas will be exposed to soil erosion and compaction when the vegetation is cleared.

Table 7-5 Impact assessment related to the loss of the land capability during the construction phase of the proposed Grid Connection.

Nature: Loss of land capability		
	Without mitigation	With mitigation
Extent	Very Low (1)	Very low (2)
Duration	Short Term (2)	Very Short Term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Low (2)
Significance	Low (24)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.3.1.1 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Low – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed in Table 7-8.

7.3.2 Operational Phase

During the operational phase, limited and negligible impacts are foreseen. Concrete areas will be equiped with drains and revegetated to reduce soil erosion on exposed areas. Maintenace of the grid connection will have to be carried out throughout the life of the project. It is expected that these maintenance practices can be undertaken by means of manual labour.

7.3.2.1 Infrastructure

The operational phase of the grid connection will only include maintenance activities undertaken by professionals. Besides compaction and erosion caused by traffic along access routes, few aspects are expected to be associated with this phase. The spread of alien invasive species will be a risk, predominantly adjacent to developed areas (edge effect).

Table 7-6 Impact assessment related to the loss of land capability during the operational phase of the proposed Grid Connection.

Nature: Loss of land capability		
	Without mitigation	With mitigation
Extent	Very low (1)	Very low (1)
Duration	Short Term (2)	Very short Term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Low (2)
Significance	Low (15)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.3.2.2 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Low – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed in Table 7-8.

7.3.3 Cumulative Impacts

The cumulative impacts have been scored "Low," indicating that the potential incremental, interactive, sequential, and synergistic cumulative impacts. It is probable that the impact will result in spatial and temporal cumulative change.

Table 7-7 Impact assessment related to the loss of land capability due to cumulative impacts of the proposed Grid Connection.

Nature: Loss of land capability		
	Without mitigation	With mitigation

Extent	Low (2)	Very Low (1)
Duration	Short term (2)	Very Short term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (18)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.3.3.1 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Low – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative".** Further mitigation is however detailed in Table 7-8.

7.4 Specialist Management Plan

Table 7-8 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators. The mitigations within this section have been taken into consideration during the impact assessment in cases where the post-mitigation environmental risk is lower than that of the pre-mitigation environmental risk. Additionally, the implementation of these strategies will improve the possibility of restoring degraded soil resources, which are likely to be impacted upon during the construction and operational phases, respectively.

Table 7-8 Mitigation measures, including requirements for timeframes, roles and responsibilities

Action plan				
Phase	**Management Action**	**Timeframe for implementation**	**Responsible party for implementation**	**Responsible party for monitoring/audit/review**
Construction	Vegetate or cover all stockpiles after stripping/removing soils	During construction phase	Contractor	ECO
	Storage of potential contaminants should be undertaken in bunded areas	During construction phase	Contractor	ECO
	All contractors must have spill kits available and be trained in the correct use thereof.	During construction phase	Contractor	ECO
	All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include	During construction phase	Environmental Officer (EO)/Contractor	ECO

	aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".			
	No cleaning or servicing of vehicles, machines and equipment may be undertaken in water resources.	During construction phase	Contractor	ECO
	Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the soil resources.	During construction phase	Contractor	ECO
Operation	Continuously monitor erosion on site	During the timeframe assigned for the life of the PV plant	Operator	dEO
	Monitor compaction on site	During the timeframe assigned for the life of the PV plant	Operator	dEO

7.5 Specialist Recommendation

The final results indicate "Low" post-mitigation significance score ratings for the proposed Naos Solar PV Project Two and Grid Connection infrastructure. It is therefore clear that the proposed activities are expected to have a low impact on land potential resources. It is worth noting that some historical "High" sensitivity crop field areas were identified by means of the DEA Screening tool (2023) even though some are historical and abandoned. These crop fields have been abandoned due to the low agricultural output and also soil drainage problems. It is the specialist`s opinion and recommended that these areas can be developed for the solar PV project as there agricultural economical potential is also low. Stakeholder engagement for compensation of landowners for these historical crop field lands in the Solar PV project area is not necessary as they have consented and agreed for the land use.

A further recommendation is to consider agriculture beneath the solar panels if this is feasible for the project. This will be limited to small-livestock grazing.

8 Conclusion and Impact Statement

Four main sensitive soil forms were identified within the assessment area, namely the Ermelo, Clovelly, Avalon and Kransfontein soil forms. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Low" and "Moderate High" sensitivities following the DEA agricultural screen Tool, (2023). However, the specialist observed soil baseline findings in the project area dispute some of these areas which were identified as "High" sensitivity now considered as historical crop lands. Overall, the project area can be assigned within a "Low to Medium" land capability potential following the soil site observations.

The assessment area is associated with both non-arable and arable soils. However, the available climatic conditions of low annual rainfall and high evapotranspiration potential severely limits crop production significantly in the arable soils resulting in land capabilities with "Low" and "Moderate" sensitivities. The land capabilities associated with the assessment area were historically suitable for rainfed cropping, irrigated cropping and livestock grazing, even though currently the lands were abandoned.

It is the specialist's opinion that the proposed Naos Solar PV Project Two and Grid Connection developments will have an overall low residual impact on the agricultural production ability of the land. The proposed activities will result in minimum segregation of some agricultural land which is characterised as historical with a low agricultural economic potential. Such crop lands are associated with sandy soils characterised with poor drainage potential for cropping practices. Infrastructure development can occur on these areas which were considered as previously high productive agricultural lands. The landowners have given consent to use the land for the proposed Solar PV project, to increase the economical land capability. The impacts from the grid pylons will be negligible, but the project development should minimise pylon placement within existing and used crop areas. Regarding grid connection alternatives, options which avoid most of these crop production fields (like servitude option 4) are preferred even though other options can be developed due to the negligible impacts. Collector Substation Option 1 is also preferable for the project. It is therefore the specialist` recommendation that, the Naos Solar PV Project Two and Grid connection power lines infrastructure be favourably considered as have being planned.

9 References

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