Agricultural Potential Assessment for the proposed Soventix Solar Photovoltaic (PV) Facility

Springs, Gauteng Province, South Africa

February 2023

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ecoleges
Environmental Consultants

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Reference	**Soventix PV**
Submitted to	ecoleges Environmental Consultants
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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, Maletsatsi Mohapi, 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.

Maletsatsi Mohapi

Soil Scientist

The Biodiversity Company

February 2023

1 Introduction

The Biodiversity Company was appointed by Ecoleges Environmental to undertake an agricultural potential assessment for the proposed development of a 1.8 MWp Solar Photovoltaic (PV) Facility at Element Six Facility in Springs, Ekurhuleni Metropolitan Municipality, Gauteng Province. The proposed project area is located approximately 0.3 km east of the R51 regional road and west to the Bevcan Springs Manufacturer (Figure 1-1).

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). The National Web based Environmental Screening Tool (DEFF, 2023) has characterised the land capability sensitivity of the project area as “High”.

The purpose of the assessment is to provide relevant input into the environmental application process. 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, enabling informed decision making as to the ecological viability of the project and the impacts that its implementation may have on the natural environment.

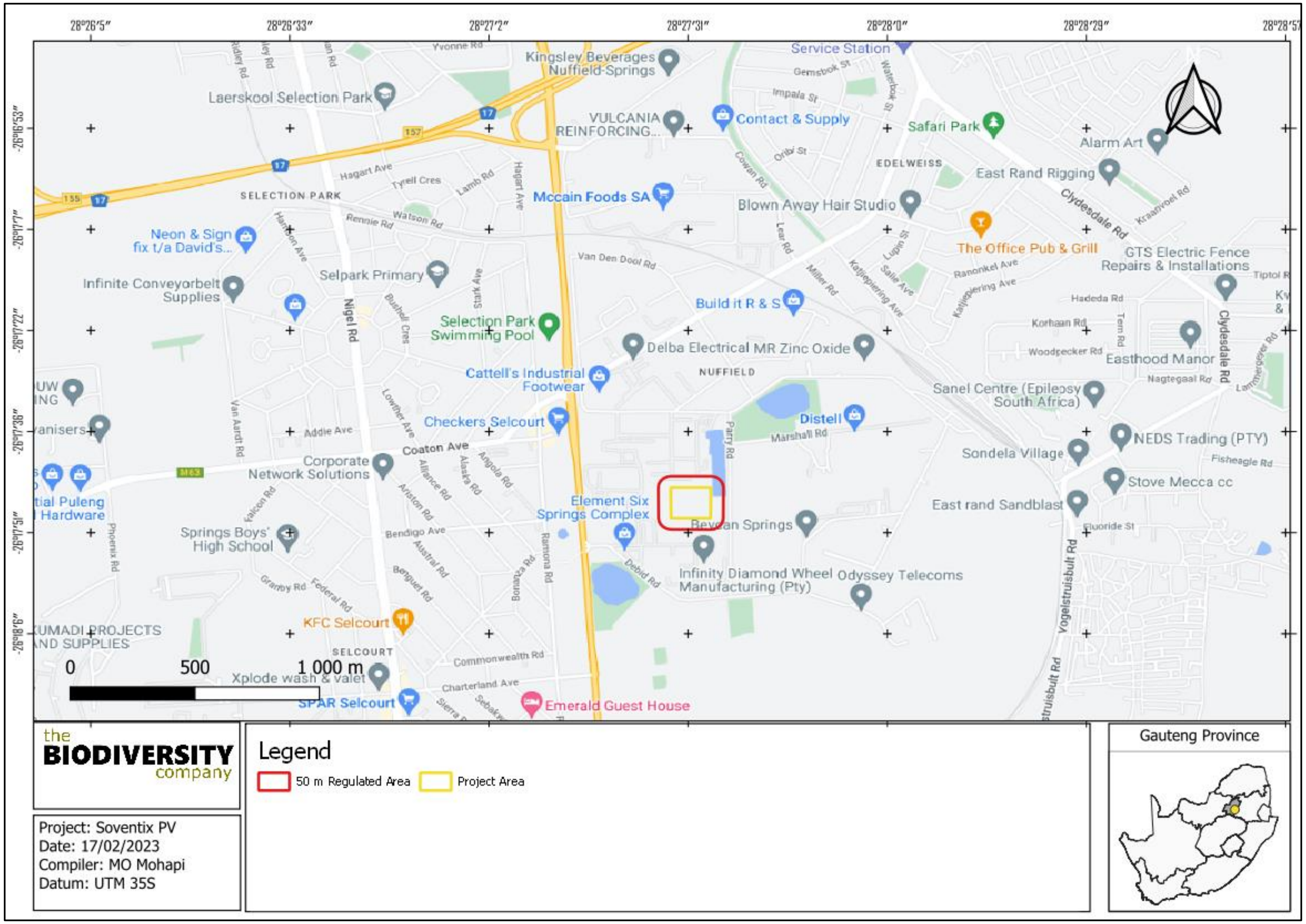


Figure 1-1 The location of the project area

1.1 Scope of Work

The porject scope of work is as follows:

- 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.

2 Methodology

2.1 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 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.

2.2 Field Survey

An assessment of the soils present within the project area was conducted during a field survey in February 2023. 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.

2.3 Erosion Potential

Erosion has been calculated by means of the (Smith, 2006) methodology. The steps in calculating the Fb1 ratings relevant to erosion potential is illustrated in Table 2-1 with the final erosion classes illustrated in Table 2-2.

Table 2-1 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

[1] The soil erodibility index

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	

Table 2-2 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

2.4 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 to that of the screening tool to ultimately determine the accuracy of the land capability sensitivity from the DAFF, (2017) sensitivities.

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 2-3 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 2-3 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 2-4. The final land potential results are then described in Table 2-5.

Table 2-4 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 2-5 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

2.5 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.

3 Project Area

3.1 Soil and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Bb 3 land type. The Bb 3 land type mainly have Hutton, Avalon, Longlands and Rensburg soil forms according to the Soil classification working group, (1991), with the occurrence of other soils within the landscape. The Bb land types are characterised of plinthic catena, in the upper terrains duplex and margalitic soils are rare. The soils mostly have dystrophic and mesotrophic base status. Red soils occur but they are not widespread within the landscape. The land terrain units for the featured Bb 3 land type are illustrated in **Error! Reference source not found.** with the expected soils listed in **Error! Reference source not found.**.

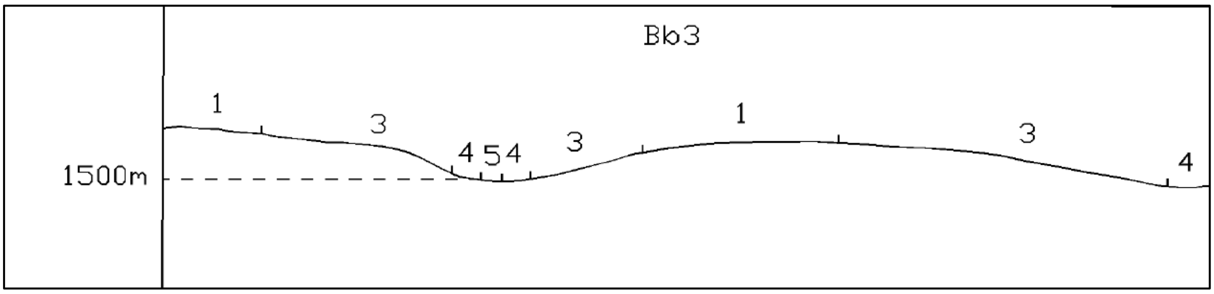


Figure 3-1 Illustration of land type Bb 3 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 3-1 Soils expected at the respective terrain units within the Bb 3 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (35%)		**3 (55%)**		**4 (5%)**		**5 (5%)**	
Hutton	40%	Avalon	45%	Longlands	20%	Rensburg	40%
Avalon	25%	Hutton	25%	Valsrivier, Swartland	20%	Katspruit	30%
Pans	15%	Glencoe	5%	Avalon	10%	Willowbrook	20%
Glencoe	10%	Mispah	10%	Westleigh	10%	Arcardia	10%
Westleigh	5%	Westleigh	5%	Hutton	10%		
Mispah	5%	Valsrivier, Swartland	5%	Estcourt	10%		
		Longlands	5%	Kroonstad	10%		
				Mispah	5%		
				Arcardia	5%		

3.2 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure **3-2**. Most of the project area is characterised by a slope percentage between 0 and 5%, with some smaller patches within the project area characterised by a slope percentage ranging from 5 to 10%. 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 **3-3**) indicates an elevation of 1 616 to 1 627 Metres Above Sea Level (MASL).

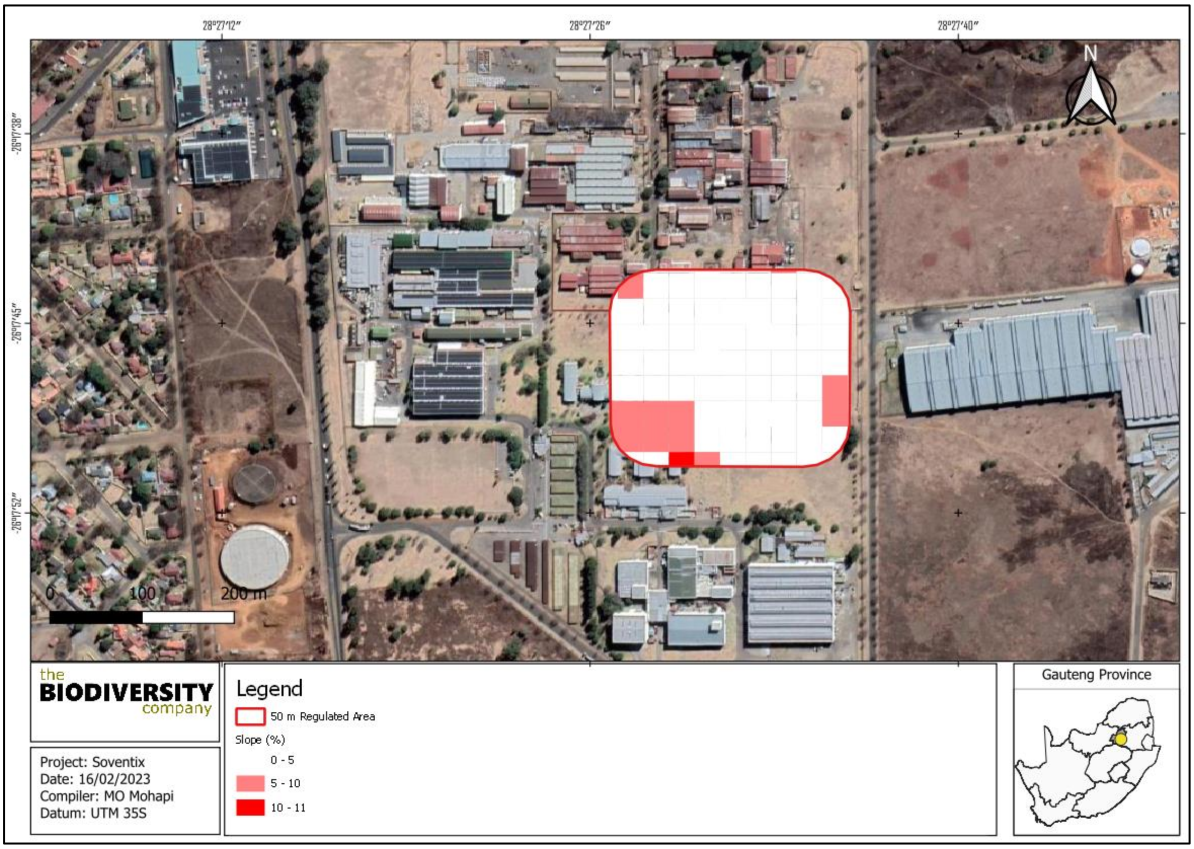


Figure 3-2 The slope percentage calculated for the project area

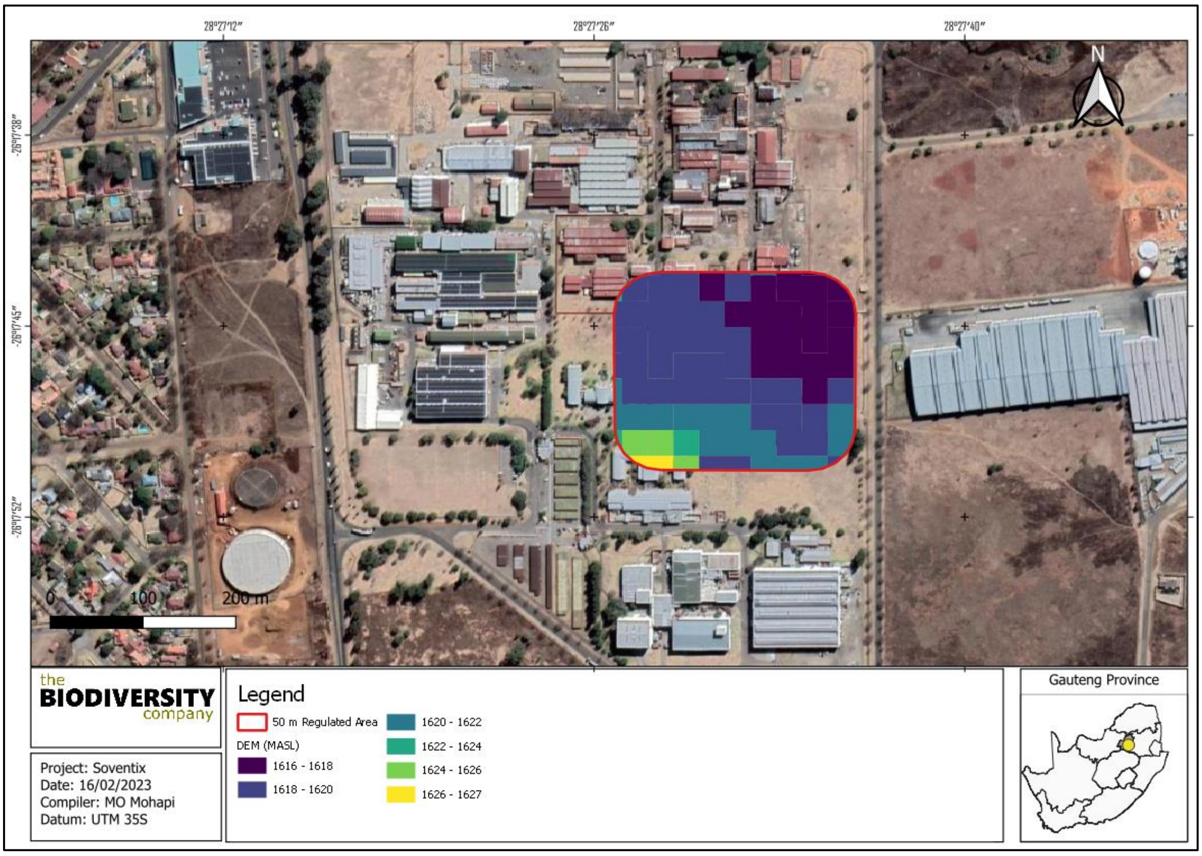


Figure 3-3 The DEM generated for the project area

4 Results and Discussion

4.1 Description of Soil Profiles and Diagnostic Horizons

Soil profiles were studied up to a depth of 1.5 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:

- Orthic topsoil;
- Yellow-Brown apedal;
- Red apedal; and
- Hard rock horizon;

4.1.1 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).

4.1.2 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.

4.1.3 Red Apedal Horizon

The red apedal horizon has red colours in the matrix and a weak than moderate structure in the moist state. The dominant uniform red pigmentation occurs due to the presence of even distributed hematite, even though they are also other dominant iron oxides present which indicates well aerated soil conditions. The clay mineral elements of red apedal horizons are similar to yellow-brown apedal horizons. Kaolinite is the dominant clay mineral. Poorly ordered or amorphous clay minerals are also present in the clay fraction in humid climates and 2:1 clay mineral can be present in semi-arid conditions. The apedal or weak structure forms in sandy textured soils. The sandy loam and finer textured horizons have a strong micro-aggregate structure resulting in stable pores and a moderate to high infiltration rate. These soils are easily tilled and support an active microfloral and microfaunal population.

4.1.4 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.

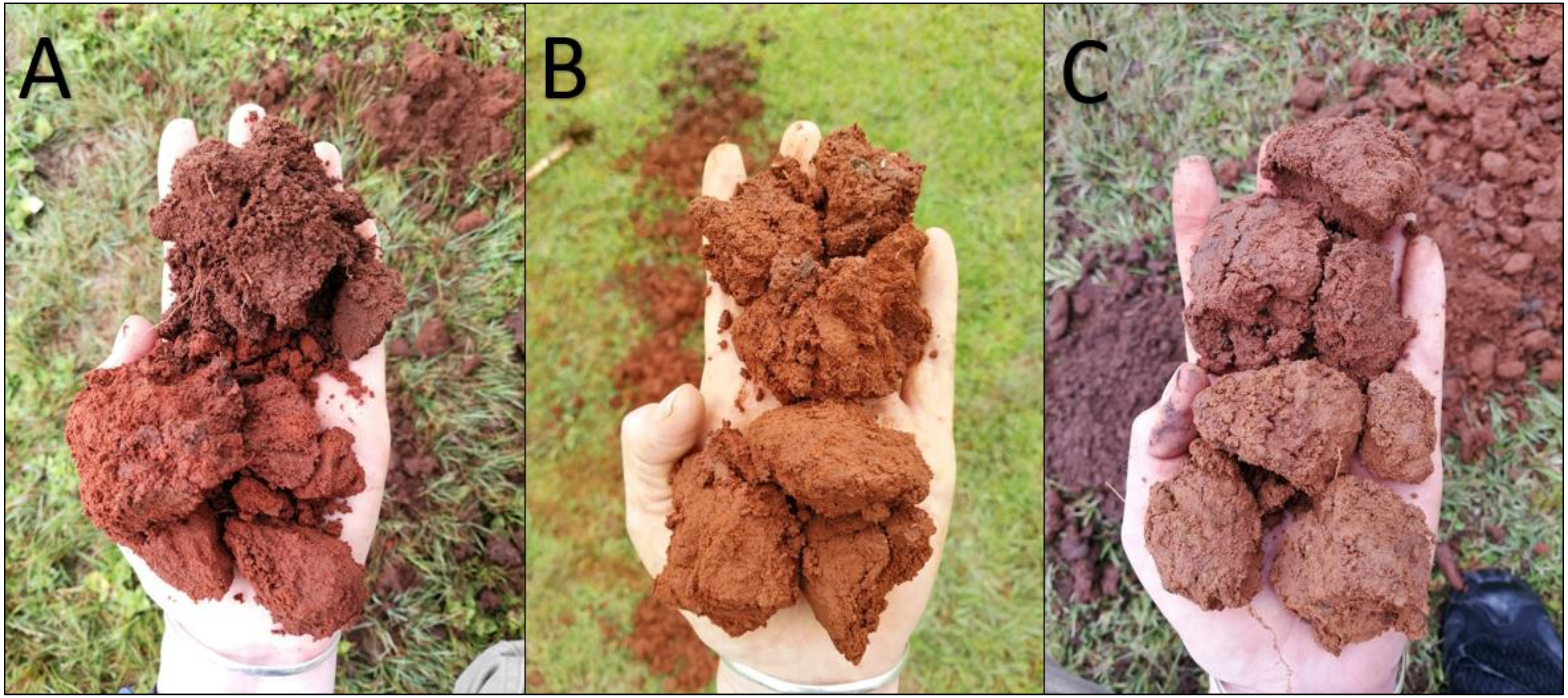


Figure 4-1 Dominant and sensitive soils identified during the site assessment. A) Orthic topsoil underlain by a thick red apedal subsoil horizon; B) Orthic topsoil on top of a thick yellow-brown apedal subsoil horizon; and C) Orthic topsoil on top of a yellow-brown apedal subsoil horizon that overlain a hard rock.

4.2 Description of Soil Forms and Soil Families

During the site assessment various soil forms were identified. These soil forms are described in Table 4-1 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 inTable 4-2.

Table 4-1 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 %**
Hutton 2220(15)	0-300	0-15	None	0	None	300-1500	0-15	None	0	-	-	-	0
Ermelo 2220 (15)	0-300	0-15	None	0	None	300-1500	0-15	None	0	-	-	-	0
Carolina 2200 (15)	0-300	0-15	None	0	None	300-500	0-15	None	10	500+	-	-	100

Table 4-2 Description of soil family characteristics

Soil Form/Family	Topsoil Colour	Base Status	Textural Contrast
Hutton 2220 (15)	Chromic Topsoil	Mesotrophic	Luvic
Ermelo 2220 (15)	Chromic Topsoil	Mesotrophic	Luvic
Carolina 2200 (15)	Chromic Topsoil	Mesotrophic	Luvic

4.3 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.

4.4 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 4-3).

Table 4-3 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 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.

4.5 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 (0-5%, 5-10%, 10-11% and >11%) 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 III and IV classes (Table 4-4).

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

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

4.6 Land Potential

The methodology in regard to the calculations of the relevant land potential levels are illustrated in Table 4-5 and Table 4-6. 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 4-5 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 4-6 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.	Moderate
Disturbed	N/A	None

4.7 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.

4.7.1 Hutton

Table **4-7** illustrates the values relevant to the erosion potential of the Hutton soil forms. The final erosion potential score has been calculated at 4.0, which indicates a “Moderate” potential for erosion.

Table 4-7 Erosion potential calculation for the Hutton soil forms

Step 1- Initial Value, Texture of Topsoil				
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 Shrink/Self-Mulching**	
-0.5			-0.5	
Step 6- Effective Soil Depth				
Very Shallow (<250 mm)			**Shallow (<250-500 mm)**	
-1.0			-0.5	

4.7.2 Ermelo

Table 4-8 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 4-8 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)**
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 Shrink/Self-Mulching**
-0.5		-0.5
	Step 6- Effective Soil Depth	
Very Shallow (<250 mm)		**Shallow (<250-500 mm)**
-1.0		-0.5

4.7.3 Carolina

Table 4-9 illustrates the values relevant to the erosion potential of the Carolina soil forms. The final erosion potential score has been calculated at 3.5, which indicates a "High" potential for erosion.

Table 4-9 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)**
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 Shrink/Self-Mulching**
-0.5				-0.5
		Step 6- Effective Soil Depth		
Very Shallow (<250 mm)				**Shallow (<250-500 mm)**
-1.0				**-0.5**

5 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 (DALRRD, 2017) across South Africa, of which two potential land capability classes are located within the proposed footprint area's assessment corridor, including;

- Land Capability 9 to 10 (Moderate to High Sensitivity).

The baseline findings and the sensitivities as per the Department of Agriculture, Land Reform and Rural Development (DALRRD, 2017) national raster file concur with one another. The proposed Soventix Solar PV development is characterised with "Moderate to High" land capability sensitivities (Figure 5-1 and Figure **5**-**2**). Due to some the environmental limitations such as the slope, climate, industrial setting and the existing developments around the proposed project area, the land potential of the proposed project area can be regarded as ranging from Moderate to Moderately Low.

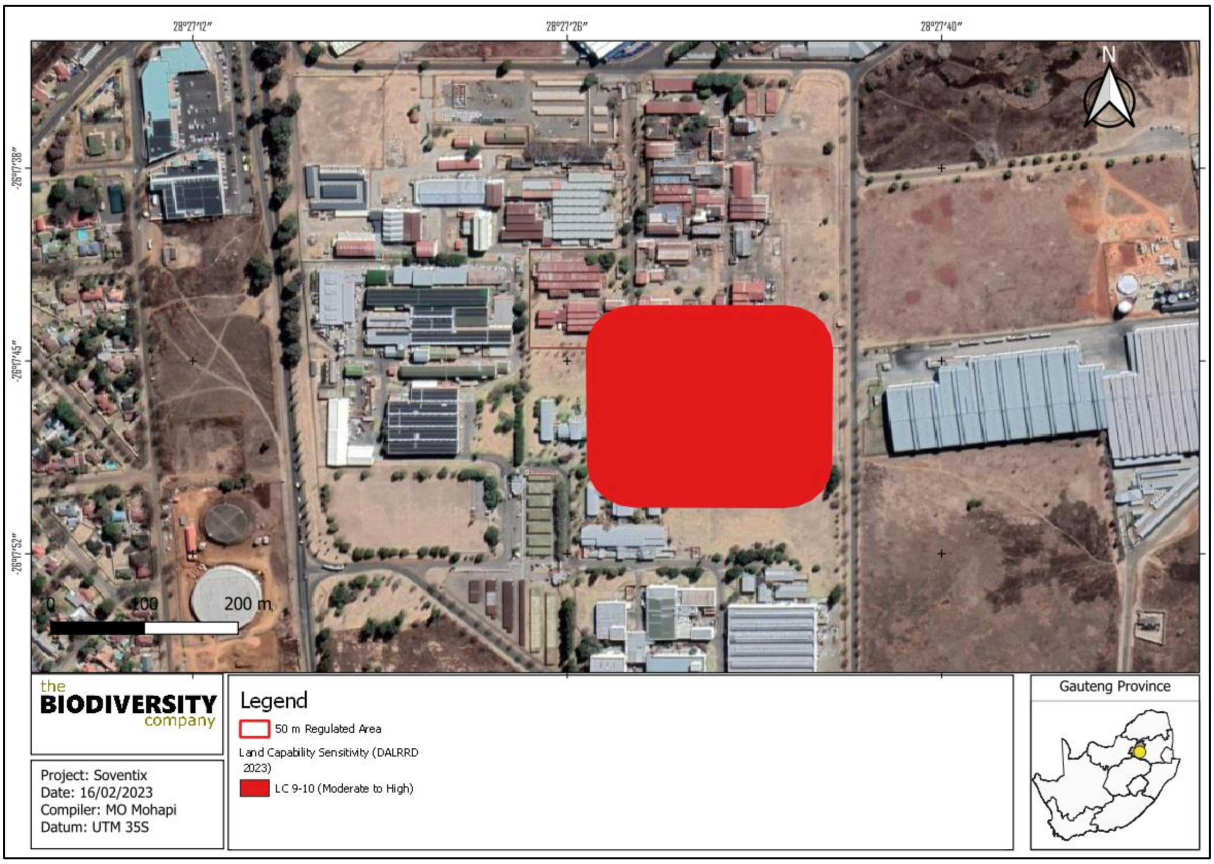
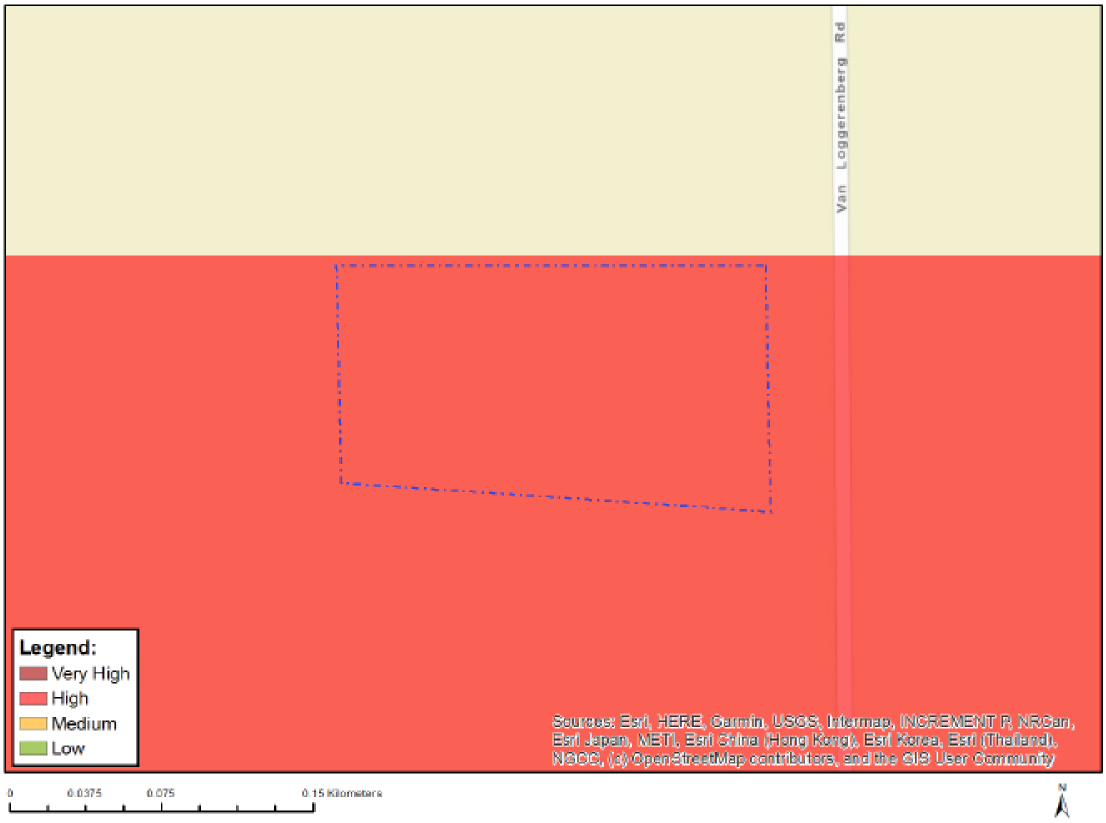


Figure 5-1 The land capability sensitivity (DALRRD, 2017)

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High

Figure 5-2 Relative agriculture theme sensitivity

6 Impact Assessment

Infrastructure within the Soventix Solar project area assigned to the available land includes transmission towers, transmission loops and access roads. The proposed activities impede into “High” land capability sensitivity fields; however, these fields are not associated with arable land potential conditions.

Impacts were assessed in terms of the Soventix Solar PV project construction and operational phases. Mitigation measures were only applied to impacts deemed relevant.

6.1 Anticipated Activities

The following are some of the activities that may be associated with the proposed Soventix PV Solar power project:

- Solar PV panels layout;
- Construction layout camps;
- BESS;
- Power Substation; and
- Access roads.

6.1.1 Alternatives Considered

There are no alternatives which were considered within the assessment area for the proposed Soventix Solar PV project.

6.1.2 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 6-1 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 6-1 Summary of unplanned events

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.

6.1.3 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 well sites and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward.

6.2 Soventix Solar PV Project

6.2.1 Construction Phase

During the construction phase, topsoil often will be cleared, stripped and stockpiled. Access roads will be created with trenches being dug for the installation of relevant cables. Erection of transmission lines where relevant to the current existing lines will occur. 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 erodable soils within the footprint assessment area, such as the Carolina soil forms. The removal 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 along the proposed solar PV.

Table 6-2 Impact assessment related to the loss of the land capability during the Solar PV Project construction phase – Pre Mitigation

Impact	**Pre Mitigation**							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability	1	4	2	2	2	3	2	
	Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

Table 6-3 Impact assessment related to the loss of the land capability during the Solar PV Project construction phase – Post Mitigation

Impact	**Post Mitigation**						
	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability	2	1	1	2	2	1	
	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	**Negative Low Impact**

6.2.1.1 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"** which are ***negligible*** cumulative effects in the proposed Solar PV project with post mitigation measures. Further mitigation is however detailed in Table 6-8 . The following specific measures are intended to secure a low residual risk:

- Avoidance of all high agricultural production land, where avoidance is not feasible stakeholder engagement should occur to compensate affected landowners;
- Make use of existing roads or upgrades tracks before new roads are constructed. The number and width of internal access routes must be kept to a minimum;
- A stormwater management plan must be implemented for the development. The plan must provide input into the road network and management measures;
- Substations foundation and pylons placement must be (preferably) located in already disturbed areas;
- Rehabilitation of the area must be initiated from the onset of the project. Soil stripped from infrastructure placement can be used for rehabilitation efforts; and
- An alien invasive plant species and control programme must be implemented from the onset of the project.

6.2.1 Operational Phase

During the operational phase, limited impacts are foreseen. 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, Solar PV infrastructure maintenamce 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.

6.2.1.1 Infrastructure

The operational phase of the Soventix Solar PV project (Constructed Infrastructure) includes anthropogenic movement and activities. The relevant infrastructure will be maintained 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 6-4 Impact assessment related to the loss of the land capability during the Solar Project Operation phase – Pre Mitigation

Impact	**Pre Mitigation**							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability, Soil erosion and compaction effects	1	2	1	2	2	2	2	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

Table 6-5 Impact assessment related to the loss of the land capability during the Solar Project Operation phase – Post Mitigation

Impact	**Post Mitigation**							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability, Soil erosion and compaction effects	1	2	1	1	2	1	1	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50%	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than	Completely reversible: The impact is reversible with	Marginal loss of resource: The impact will result in	Negligible cumulative impact: The impact	Low: Impact affects the quality, use and integrity of the system/component	**Negative Low Impact**

		chance of occurrence).	the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	implementation of minor mitigation measures.	marginal loss of resources.	would result in negligible to no cumulative effects.	in a way that is barely perceptible.	

6.2.1.2 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 6-8.

6.2.2 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 6-6 Impacts related to the loss of land capability with the proposed Soventix Solar Power project– Project in Isolation

Impact	**Project in Isolation**							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of land capability, soil erosion and compaction effects	1	2	2	1	2	1	2	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

Table 6-7 Cumulative impacts related to the loss of land capability with the proposed Soventix Solar Power project

Impact	**Cumulative Effect**							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of land capability, soil erosion and compaction effects	1	3	2	2	2	2	2	
	Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

6.2.2.1 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 Negligible **"Low – Negative."** Further mitigation is however detailed in Table 6-8.

6.3 Specialist Management Plan

Table 6-8 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 the construction and operational phases, respectively.

Table 6-8 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 aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	During construction phase	Environmental Officer (EO)/Contractor	ECO
	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 aquatic systems.	During construction phase	Contractor	ECO
Operation	Continuously monitor erosion on site	During the timeframe assigned for the life of the Power line	Operator	dEO

	Monitor compaction on site	During the timeframe assigned for the life of the Power line	Operator	dEO

6.4 Specialist Recommendation

The results indicate ““Low” post-mitigation significance score ratings for the proposed Soventix PV project and associated 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 “High” Land Capability Sensitivity areas were identified by means of the DEFF Screening tool (2023) in the current existing project assessment area. It is recommended stakeholder engagement must be undertaken during the project phases to investigate possible scenarios for appropriate compensation of landowners where necessary.

7 Conclusion and Impact Statement

Three main sensitive soil forms were identified within the assessment area, namely the Hutton, Ermelo and Carolina soil forms. The land capability sensitivities (DALRRD, 2017) indicate land capabilities with “Moderate” to “Moderate high” sensitivities, which correlates with the findings from the baseline assessment. However, due to the existing developments around the project areas, the industrial setting in which the project area is located in and environmental factors such as climate, the project area may therefore be assigned an overall sensitivity of ‘Moderate’.

The assessment area is associated with non-arable soils. In addition, the available climatic conditions of low annual rainfall and high evapotranspiration potential severely limits crop production significantly resulting in land capabilities with “Moderate” and “Moderate low” sensitivities. The land capabilities associated with the assessment area are suitable for recreational, industrial, and commercial purposes, which corresponds with the current land use.

It is the specialist’s opinion that the proposed Soventix Solar PV project and infrastructure will have an overall low residual impact on the agricultural production ability of the land. The proposed activities will not result in any segregation of some high production agricultural land. It is, therefore, the specialist`s recommendation that the proposed Soventix Solar PV project and associate infrastructure may be favourably considered for development with implementation of mitigation measure to ensure low expected significant impacts occurrence.

8 References

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