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Soil and Agricultural Potential Scoping Report for the Proposed Harmony Joel Solar PV Facility

Submitted by TerraAfrica Consult cc

Mariné Pienaar

21 August 2022

Declaration of the Specialist

Details of Specialist

Report author: M Pienaar
Contact number: 082 828 3587
Email address: mpienaar@terraafrica.co.za
Physical address: 7 Smuts Street, Wolmaransstad, 2630

SACNASP Registration Number: 400274/10

Fields of registration: Soil Science
Agricultural Science

Declaration of Independence

I, Mariné Pienaar, hereby declare that TerraAfrica Consult, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

I further declare that I was responsible for collecting data and compiling this report. All assumptions, assessments and recommendations are made in good faith and are considered to be correct to the best of my knowledge and the information available at this stage.

TerraAfrica Consult cc represented by M Pienaar
21 August 2022

1. INTRODUCTION

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd to conduct the agricultural agro-ecosystem specialist assessment as part of the Scoping and Environmental Impact Assessment process for the proposed development of a solar energy facility.

Free Gold Harmony (Pty) Ltd, is looking to supplement its energy supply by implementing Photovoltaic (PV) generation, aiding their transition to a more sustainable and environmentally friendly energy mix.

Located north east of the Harmony Joel operations, approximately ~20km north east of the town of Theunissen within the Masilonyana Local Municipality and within the Lejweleputswa District Municipality, Free State Province. The PV facility is located on Portion 0 of the Farm Leeuwbult 580.

A technically feasible project site, with an extent of 43.2 ha has been identified by Free Gold Harmony (Pty) Ltd as a technically suitable area for the development of the Project. A development area of ~36 ha was demarcated within this project site and allows an adequate footprint for the installation of a solar PV facility with a contracted capacity of up to 18MW, while allowing for the avoidance of environmental site sensitivities. The size of the development footprint within the development area will be confirmed in the EIA Phase once the facility layout is available for assessment.

The development footprint will contain the following infrastructure to enable the Solar PV Facility to generate up to 18MW:

- PV modules and mounting structures
- Inverters and transformers a SCADA room, and maintenance room
- Cabling between the project components, to be laid underground where practical
- Access roads, internal roads and fencing around the development area.
- Temporary and permanent laydown areas and O&M buildings.
- Overhead Power Lines (OHPL)
- Grid connection solution which will tie-in to Shafts 1 & 2 HJ Joel Mining (6.6/132 kV), via a 1.2km South West overhead line with a capacity of 44 kV.

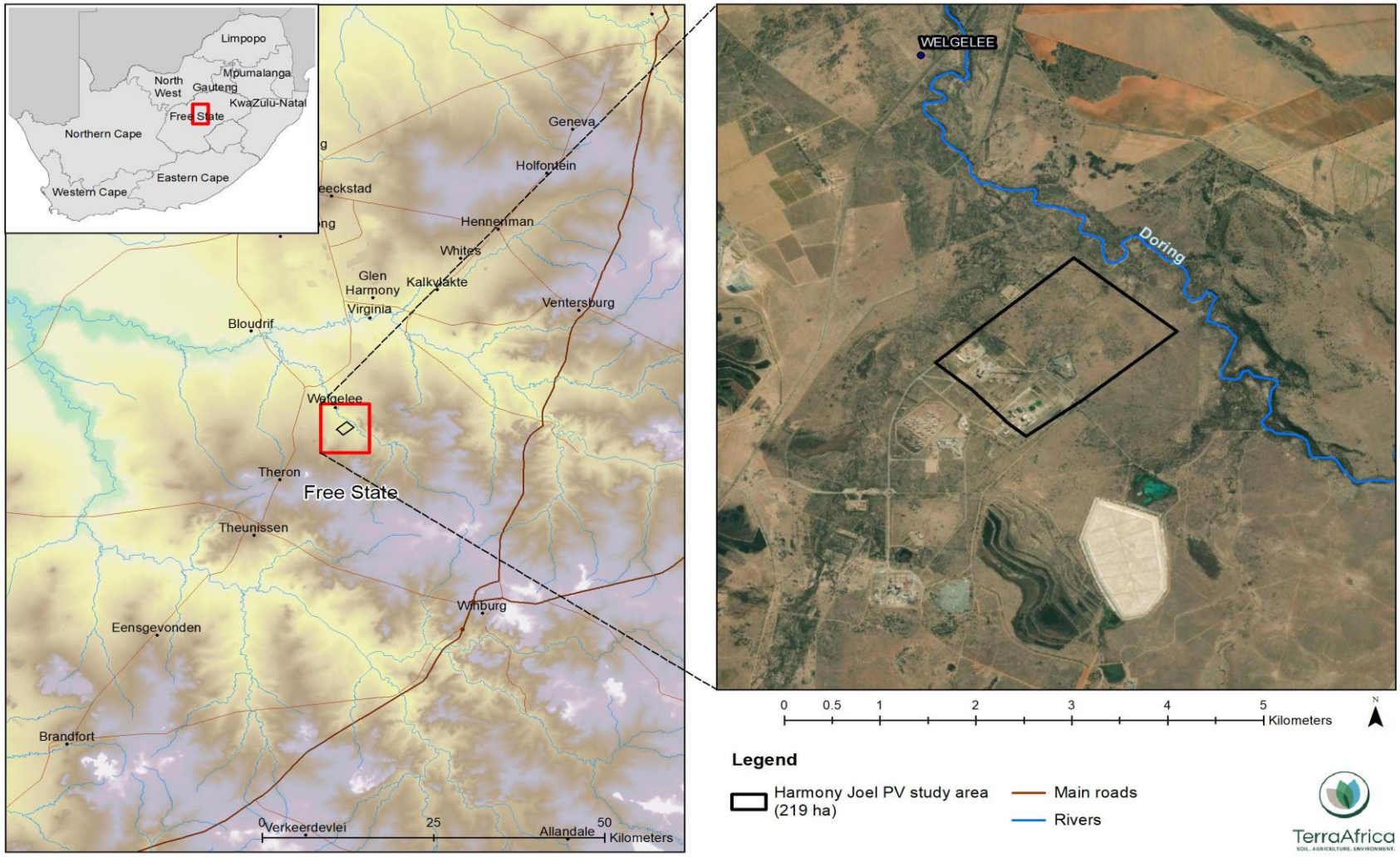

Figure 1 Locality of the proposed Harmony Joel PV Facility

2. TERMS OF REFERENCE

The terms of reference applicable to the soil and agricultural potential scoping assessment include the following:

- Conduct a desktop assessment of the baseline soil and agricultural properties for the proposed development area.
- Identify site sensitivities to the proposed project pertaining to the soil properties, associated land capabilities and the agricultural potential of the project area.
- Identify potential impacts that will be caused by the project and that will have to be assessed as part of the detail study phase.
- Identify a plan of study that will include the methodology to be followed during the detailed soil and agricultural potential impact assessment that will form part of the final EIA report that will be submitted.

3. METHODOLOGY

The proposed development area was superimposed on four data sets to determine the anticipated sensitivities of the properties to the development. The data sets are:

The newly released National Land Capability Evaluation Raster Data Layer was obtained from the DALRRD to determine the land capability classes of the development area assessment zone according to this system. The data was developed using a spatial evaluation modelling approach (DALRRD, 2017).

- The long-term grazing capacity for South Africa 2018 was analysed for the area and surrounding area of the project assessment zone. This data set includes incorporation of the RSA grazing capacity map of 1993, the Vegetation type of SA 2006 (as published by Mucina L. & Rutherford M.C.), the Land Types of South Africa data set as well as the KZN Bioresource classification data. The values indicated for the different areas represent long term grazing capacity with the understanding that the veld is in a relatively good condition.
- The Free State Field Crop Boundaries (November 2019) was analysed to determine whether the proposed PV development area falls within the boundaries of any crop production areas. The crop production areas may include rainfed annual crops, non-pivot and pivot irrigated annual crops, horticulture, viticulture, old fields, small holdings and subsistence farming.
- Land type data for the development area 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 entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units.

4. BASELINE DESCRIPTION

4.1 Land capability

The development area includes five different land capability classes according to the land capability data (DALRRD, 2017). **Figure 2** indicates the position of the different classes within the farm portions that form the proposed development area. The entire development area largely consists of land with Low-Moderate (Class 6) to Low-Moderate (Class 7) land capability. Smaller patches in the south and north consist of land with Low (Class 5) land capability. Small patches of Moderate land capability (Class 8) are found in the centre of the study area. Classes 08 have potential to produce specific crops under rainfed conditions while classes 06 and 07 are likely to be very marginal arable land that is more suitable for livestock grazing.

4.2 Field crop boundaries

The Harmony Joel Solar PV Facility development area exclude areas where field crops have previously been produced (see Figure 3). Large fields with rainfed crops and/or planted pastures are located around the study area with old fields to the north-west and north-eastern side of the study area.

4.3 Grazing capacity

The ideal grazing capacity is an indication of the long-term production potential of the vegetation layer growing in an area. More specifically, it relates to its ability to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)) with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in a number of hectares per LSU (ha/LSU) (South Africa, 2018).

Following the metadata layer obtained from DALRRD, the grazing capacity of the largest section of the development area, is 6 ha/LSU. (**Figure 4**). Since the proposed infrastructure within the development area will be fenced off, it will no longer be available for livestock grazing.

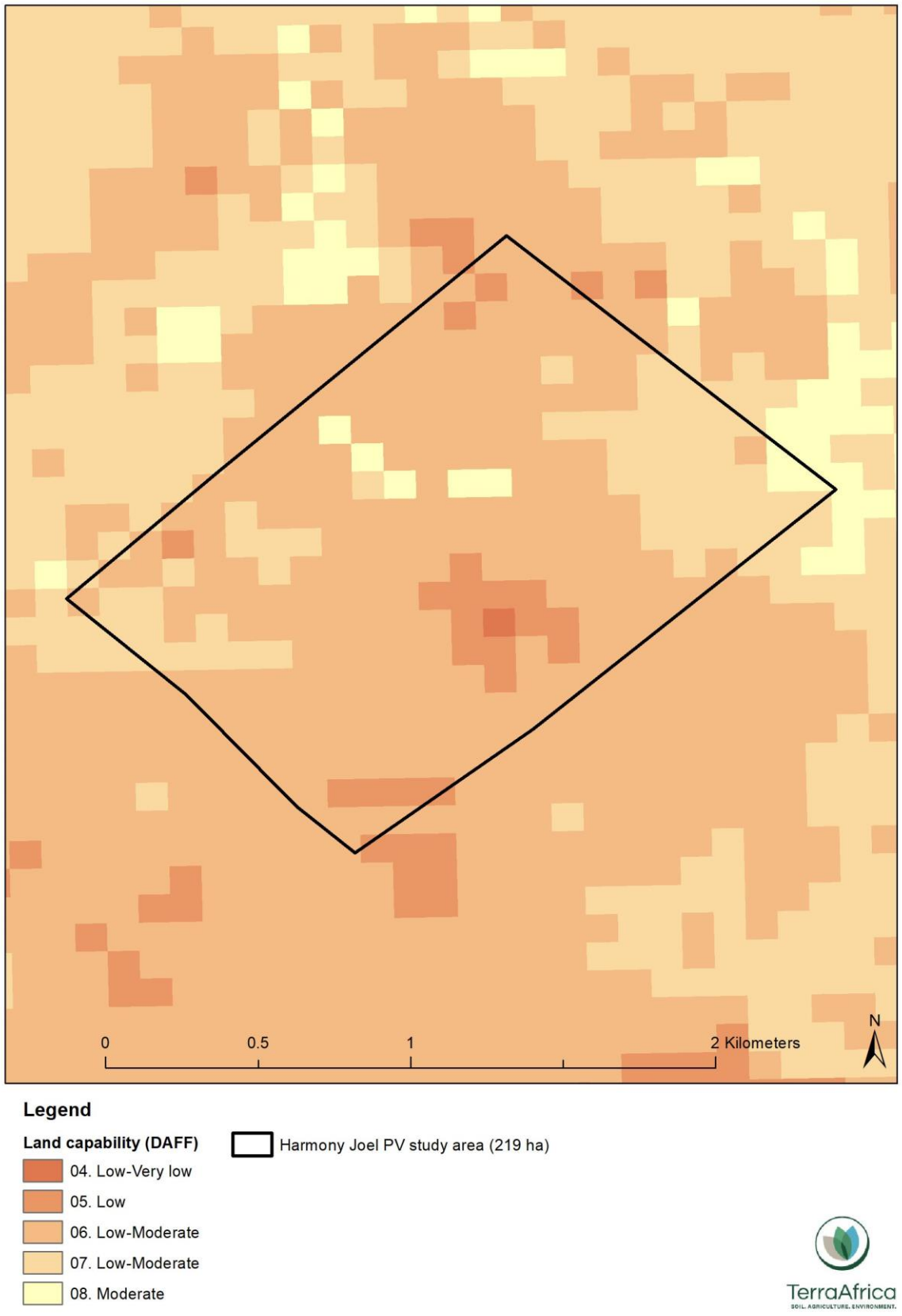

Figure 2 Land capability classification of the proposed Harmony Joel Solar PV Facility

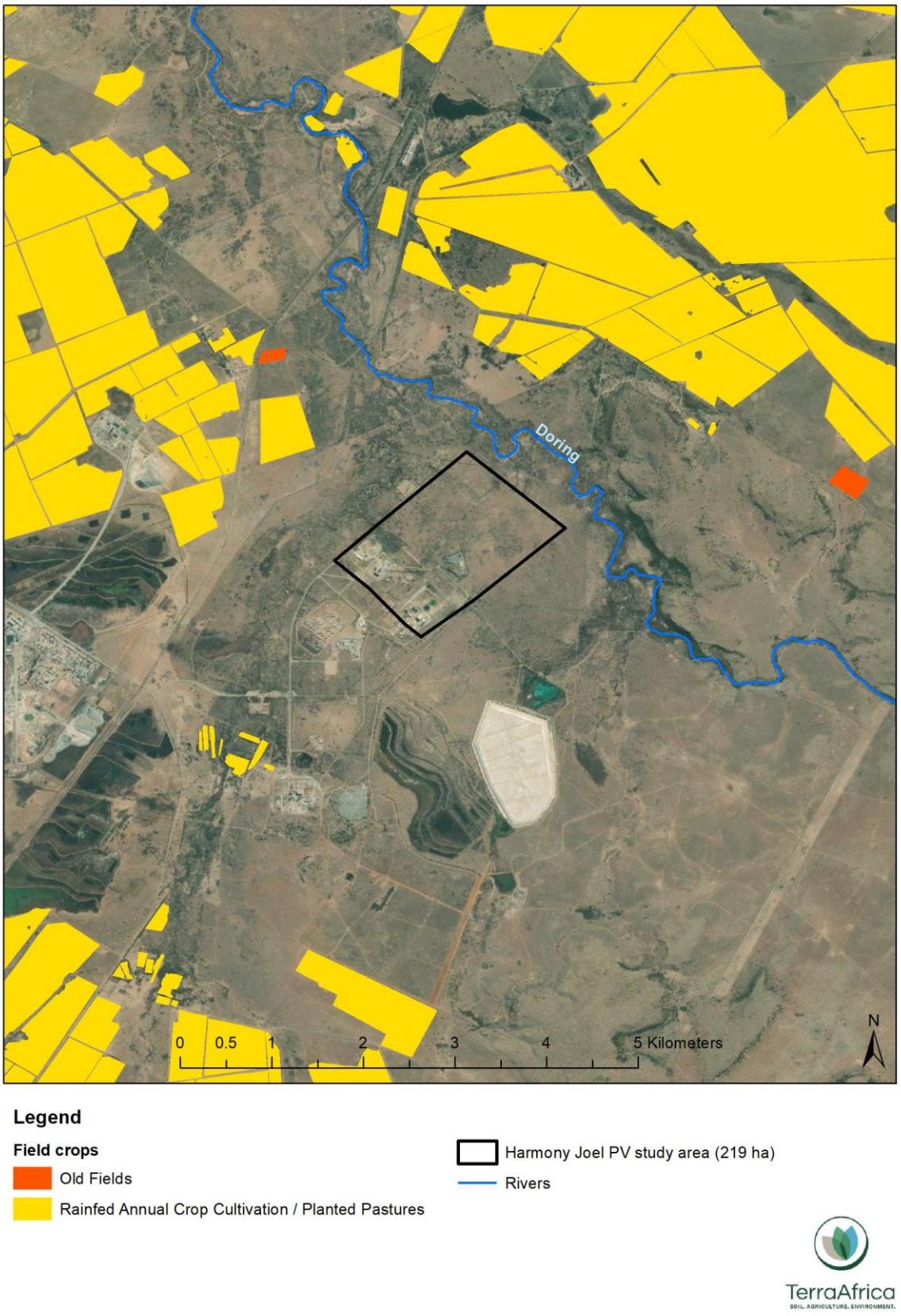

Figure 3 Locality of field crops within and around the development area of the Harmony Joel Solar PV Facility (source: DALRRD 2019)

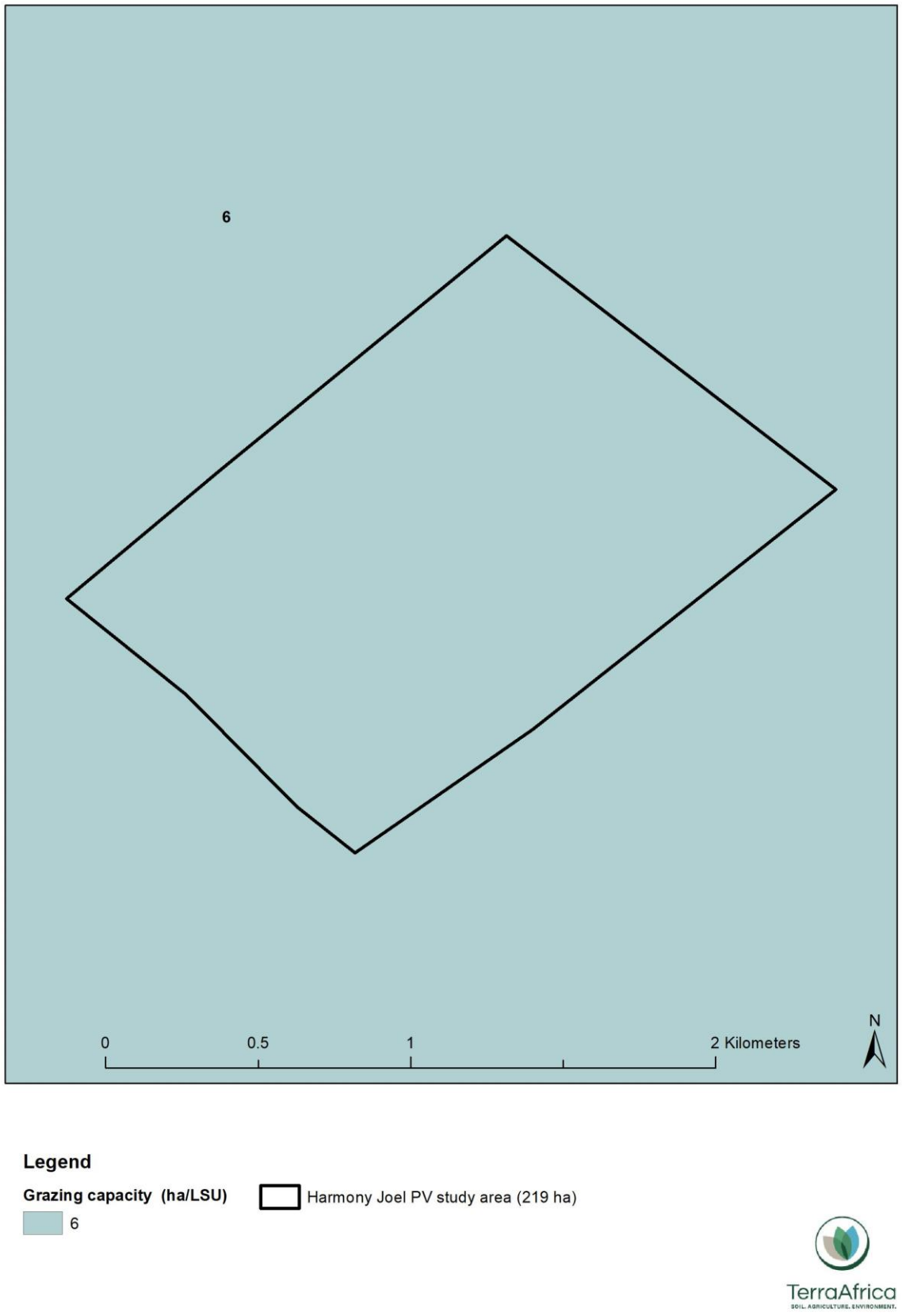

Figure 4 Long-term grazing capacity of the proposed development area of the Harmony Joel Solar Energy Facility

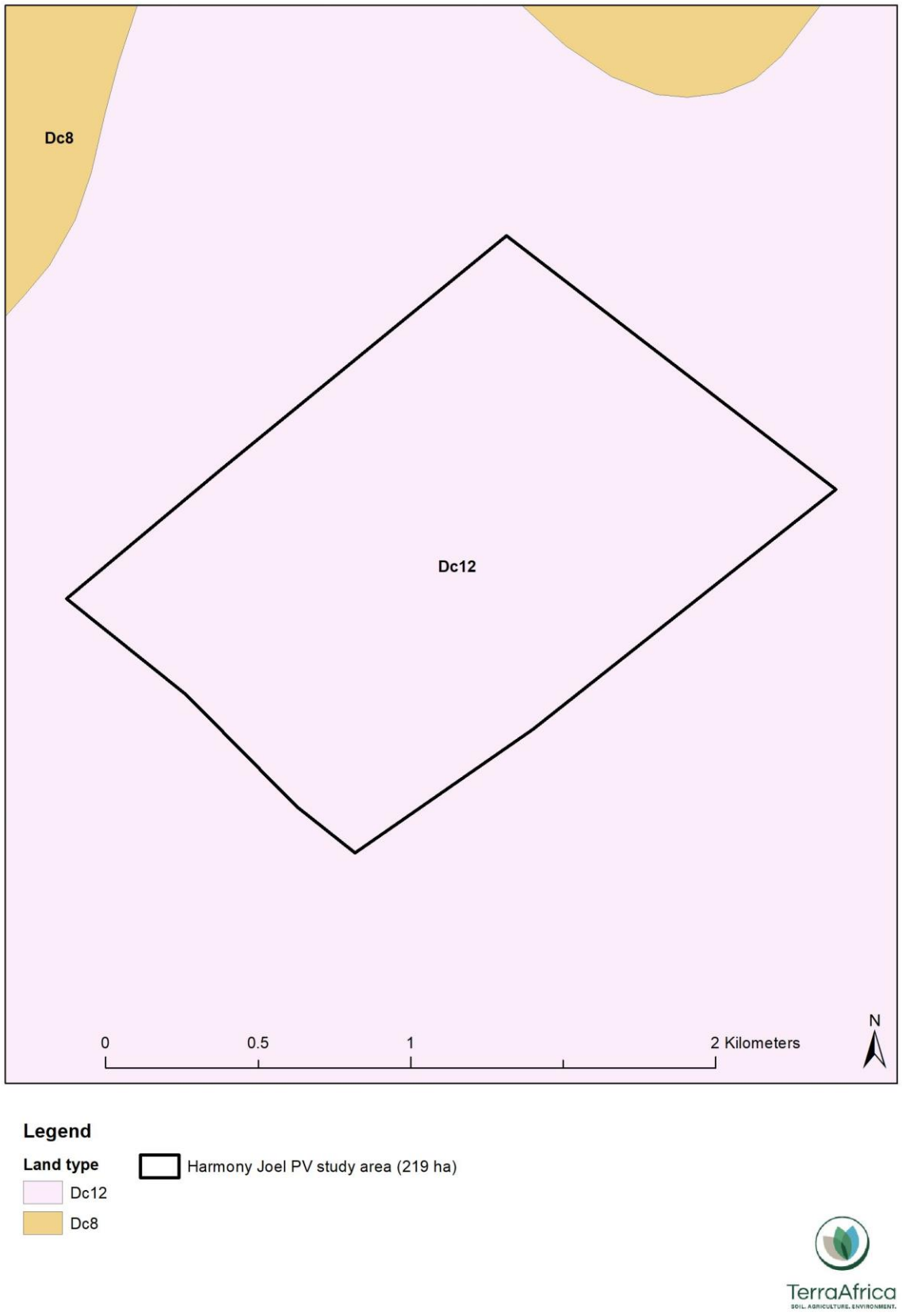

Figure 5 Land type classification of the proposed development area of the Harmony Solar Energy Facility

4.4 Land type classification

The development area consists of Land Type Dc12. The characteristics of the land type is described below and their positions in the landscape depicted in **Figure 5**.

Land Type Dc12

Land Type Dc12 consists of five terrain units and the landscape can be described as slightly undulating with slopes ranging between 1 and 30%. The soil formed from sandstone, mudstone and shale. The crest (Terrain unit 1) is dominated by Swartland, Mispah and Glenrosa soil forms. The texture of soil in this terrain unit is dominated by sand-clay-loam with the clay fraction estimated as 15-25%. Terrain unit 3 (mid-slope) forms 38% of land type Dc12.

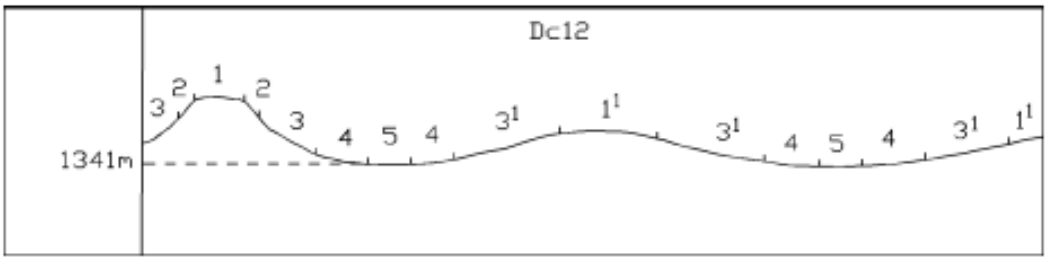

Figure 6 Terrain form sketch of Land Type Dc12

The mid-slopes consist of shallow Valsrivier, Swartland (0.1-0.3m) and Glenrosa (0.15-0.2m) The toe-slopes (Terrain unit 4) is dominated by the shallow Bonheim soil form. Valsrivier, Swartland, Glenrosa Mispah soil forms are also present in the toe slope. Terrain unit 5 (Valley bottom) consists of Dundee, Arcadia, Bonheim, Valsrivier, Mayo and Sterkspruit soil forms. The soil depth ranges from 0.1m (Mayo) to 1.2m (Dundee). The clay content ranges from 15 – 65%.

5. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

5.1 Project description

The project will entail the construction and operation of a 18 MW Photovoltaic (PV) Solar Facility ('Harmony Joel Solar PV Facility') and associated Battery Energy Storage System (BESS). The development area will be approximately 219 ha.

5.2 Potential impacts on soil

The anticipated impacts of the proposed project on soil are soil compaction, erosion, soil pollution and the loss of soil fertility from the topsoil horizons to be stripped and stockpiled during the construction phase. Below follows a description of the impacts anticipated:

The most significant impact will most likely be caused by the traversing of vehicles over the terrain during the construction phase. This will result in soil compaction. Soil compaction affects the infiltration of rain into the soil and will increase the risk of erosion as a result of this. Deep level soil compaction (as caused by heavy vehicle traffic) is difficult to alleviate.

Impact: Soil compaction			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Soil compaction reduces the water infiltration rate of soil that increase the risk of run-off	Negative	Local	None
Description of expected significance of impact Wherever the impact occurs (where heavy vehicles traverse) the impact is expected to be of moderate significance.			
Gaps in knowledge & recommendations for further study • Soil samples that will be taken during the site visit will be analysed to determine whether the soil physical properties of the site are particularly sensitive to soil compaction.			

Soil erosion is considered another possible impact, especially where vegetation will be removed during the construction phase of the project.

Impact: Soil erosion			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Bare soil surfaces are prone to loss of soil particles because of wind and water movement	Negative	Local	None
Description of expected significance of impact The impact is expected to be of moderate significance.			
Gaps in knowledge & recommendations for further study • Soil samples that will be taken during the site visit will be analysed to determine the erodibility risk of the soil in the development area.			

In any area where topsoil will be stripped for construction purposes, the inherent soil fertility and in situ soil horizon organisation will be compromised.

Impact: Loss of soil fertility through disturbance of in situ horizon organisation			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Earthworks as part of construction of the Solar Energy Facility will result in disturbance of in situ soil profiles	Negative	Local	None
Description of expected significance of impact Low to moderately low significance			
Gaps in knowledge & recommendations for further study • The results of the soil survey that will be conducted will be used to determine the sensitivity of the in situ profiles to this impact.			

Chemical soil pollution may occur as a result of oil and fuel spills from construction vehicles as well as any other waste products that may be generated on site and not properly handled.

Impact: Soil chemical pollution

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Oil and fuel spillages as well as waste generation during the project cycle will result in soil chemical pollution.	Negative	Local	None
Description of expected significance of impact The significance of this impact is moderate to high.			
Gaps in knowledge & recommendations for further study • The only knowledge gap is the full project description that includes detail of activities and materials that may result in soil pollution during the different project phases.			

5.3 Potential impacts on agriculture

The proposed Harmony Joel Solar PV Facility project will result in changing the current land use from agriculture (both crop production and livestock farming) to renewable energy generation. The cumulative impact on land use is that portions of land that were previously used for agriculture in the region are converted into alternative land uses.

Impact: Reduction or loss of agricultural productivity			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
The proposed project will change reduce the areas where crops and livestock are produced.	Negative	Local	None / Will be determined during the detail assessment
Description of expected significance of impact The proposed project may have a low to high impact on the agricultural production of the development area.			
Gaps in knowledge & recommendations for further study The economic viability of rainfed annual crop production and livestock farming within the development area, will be calculated during the detail study phase.			

Impact: Change in numbers of employment opportunities			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
The proposed project will result in the possible loss of agricultural employment opportunities.	Negative to Positive	Local	None / Will be determined during the detail assessment
Description of expected significance of impact Although the change in land use may result in a loss of agricultural jobs, it may be substituted or improved by the number of employment opportunities that will be created by the proposed project.			
Gaps in knowledge & recommendations for further study It is not currently know how many agricultural jobs are made possible by the agricultural activities within the proposed Harmony Joel SEF development area. This will be investigated through			

informal discussions with the current landowner (or person/entity leasing the land for agricultural production)

5.4 Potential impacts on land capability

The land capability of the area where the proposed project will be located will not be affected by the proposed project.

Impact Change in the land capability of the site			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Where in situ soil profiles are disturbed by construction activities, the land capability may be altered	Negative	Local	None
Description of expected significance of impact The site has low-moderate to moderate-high land capability and the proposed project will reduce the land capability of the surface infrastructure footprint. The significance of this impact ranges from low to moderate-high, depending on the specific land capabilities of the soil within the development area.			
Gaps in knowledge & recommendations for further study The final land capability will be determined during the detail study phase.			

6. PLAN OF STUDY

A site visit will be conducted to determine the soil properties and associated agricultural potential of the proposed Harmony Joel Solar PV Facility The area to be surveyed is the development area of 219ha. This area includes for the proposed surface footprint as well as a 50m buffered area around it.

The soil will be classified according to the most recent Soil Classification System for South Africa (Soil Classification Working Group, 2018). The following data will be recorded during the site visit:

- Soil forms present within the development area
- Soil depth
- Topsoil and subsoil clay percentages
- Terrain units and slope of the development area

The data points of the spatial data that will be generated during the site visit, will be interpreted for the soil and land capability mapping of the final Soil and Agricultural EIA-level report to be submitted for the proposed Harmony Joel Solar Energy Facility. The productivity and employment data will be gathered through discussion sessions with the landowners of the farm portions or otherwise the main users.

Following the results of the survey and data analysis, the final proposed project infrastructure layout will be used to calculate whether the proposed Harmony Joel SEF will be within the allowable development limits for renewable energy developments or where it exceeds it.

The report will be prepared in alignment with all the relevant NEMA regulations as well as General Notice 320 of 2020 that specifically address Agricultural Compliance reporting for the renewable energy sector.

7. CONCLUSION

Following the desktop analysis of available data, it is concluded that the proposed development of the Harmony Joel Solar PV Facility and supporting infrastructure, will affect land with low-moderate to moderate land capability. Soil in the area include oxidic yellow-brown and red apedal forms, soils with higher clay content and structure such as that of the Bonheim, Valsrivier and Swartland forms, shallower soil forms underlain by lithic horiozons

No crop cultivation has taken place within the development area.The soil and agricultural sensitivity of the site therefore varies between low and moderate, depending on the soil properties, topography and other landscape features of the development area.

No no-go areas have been identified for the proposed project from the perspective of soil and agricultural resource conservation. It is anticipated that the proposed project will have low to moderate-high impact on the soil properties and land capability. Further investigation of the site sensitivities will be conducted during the EIA phase to confirm the sensitivities as well as the anticipated impacts of the proposed Harmony Joel Solar PV Facility.

8. LIST OF REFERENCES

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