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**Soil and Agricultural Potential Scoping Report for the
Proposed Rondavel Solar PV Facility**

Submitted by TerraAfrica Consult cc

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19 November 2020

Declaration of the Specialist

Details of Specialist

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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
19 November 2020

1. INTRODUCTION

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd to conduct the agricultural compliance statement report as part of the Scoping and Environmental Impact Assessment process for the proposed development of a solar PV facility.

The development area for this project is located approximately 7 km south-west of Kroonstad within in the Moqhaka Local Municipality which falls within jurisdiction of the Fezile Dabi District Municipality of the Free State Province (**Figure 1**). The proposed infrastructure will be developed on the following properties:

- Remainder of the Farm Rondavel Noord 1475
- Remainder of the Farm Rondavel 627

These properties are collectively referred to as the project site and have a combined extent of around 2027ha. Within this area, a development area of approximately 300ha has been identified as the planned area for the Rondavel Solar 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 which was obtained from the DAFF to determine the land capability classes of the development area according to this system. The data was developed using a spatial evaluation modelling approach (DAFF, 2017).

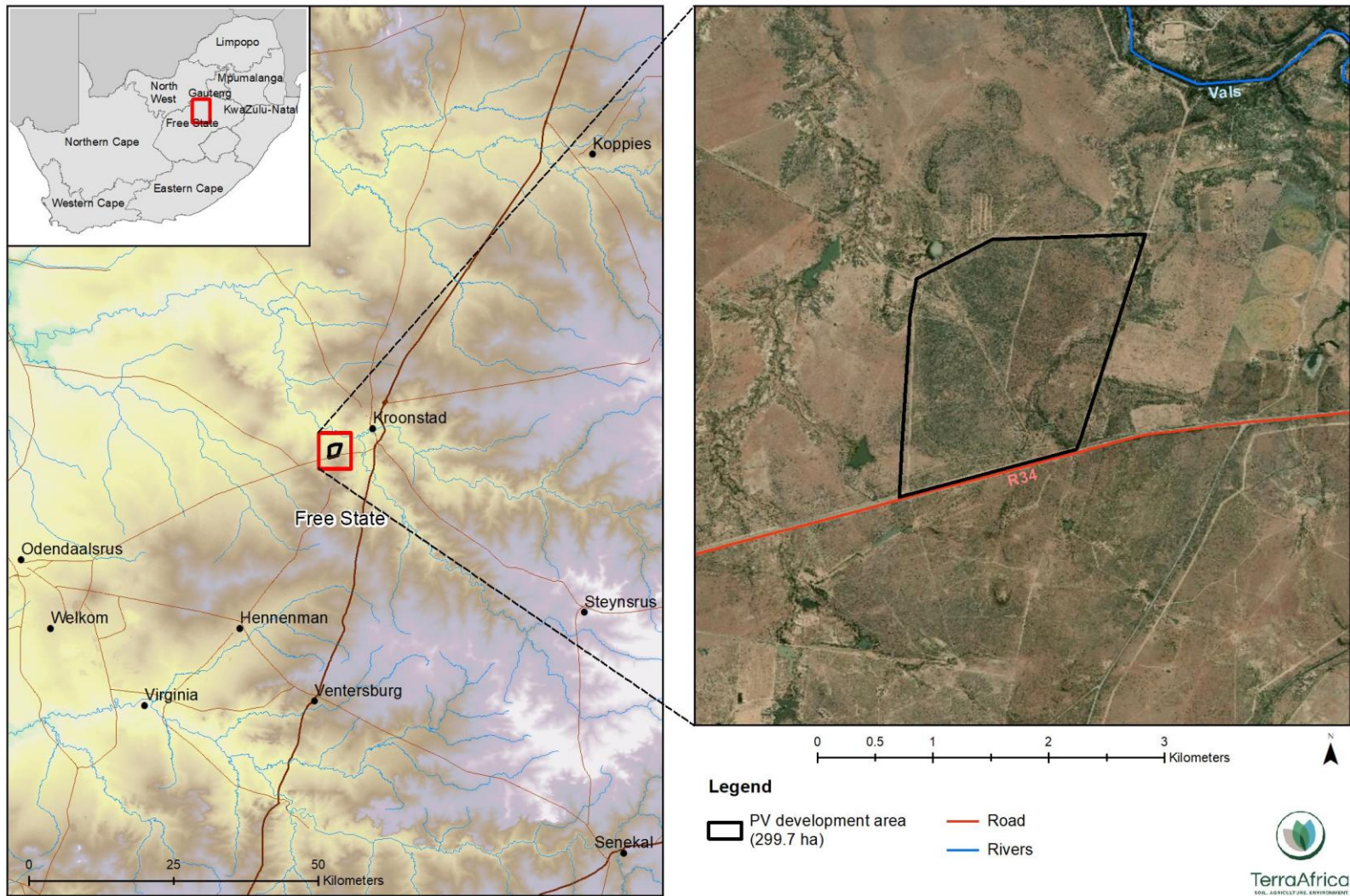


Figure 1 Locality of the proposed Rondavel Solar PV Facility

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- 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

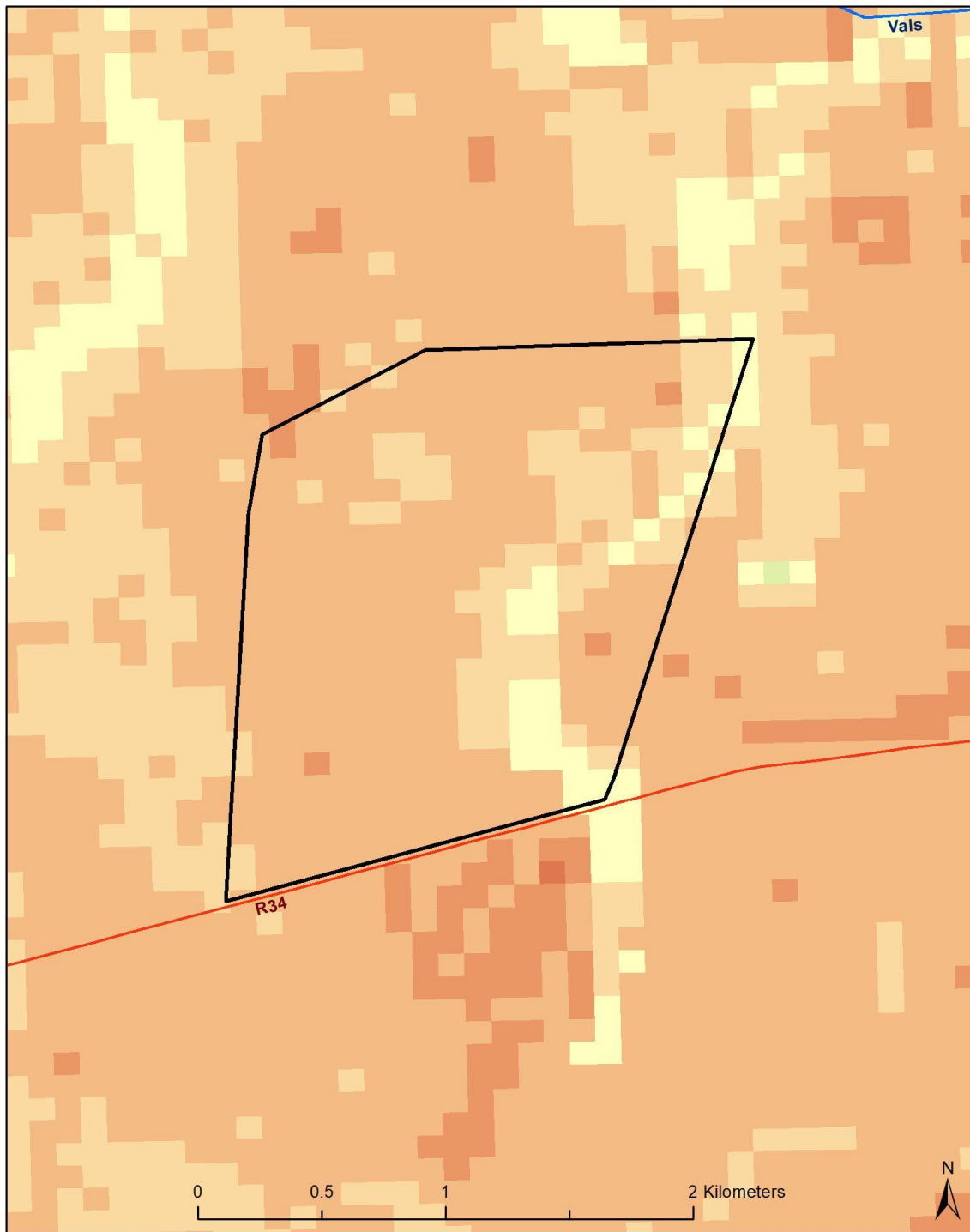
4.1 Land capability

The Rondavel Solar PV Facility development area includes four different land capability classes according to the land capability data (DAFF, 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) land capability. Smaller patches of land in a strip that runs from the north-eastern corner with a curve to the south-eastern corner consist of land with Low- Moderate to Moderate (Classes 07 and 08) land capability. Class 08 have potential for the production of specific crops under rainfed conditions while classes 05 to 07 are likely to be very marginal arable land that is more suitable for livestock grazing.

4.2 Field crop boundaries

The position of field crops around the proposed Rondavel Solar PV Facility development area is illustrated in **Figure 3**. There are no field crop boundaries within this area. Planted pastures to the north and east of the development area. Several pivot irrigation fields are located outside the development area, to the east of it. Some old fields are located to the south of the development area.

Following this data, there is no risk that rainfed or irrigated crop production will be affected by the proposed development.



Legend

Land capability (DAFF)

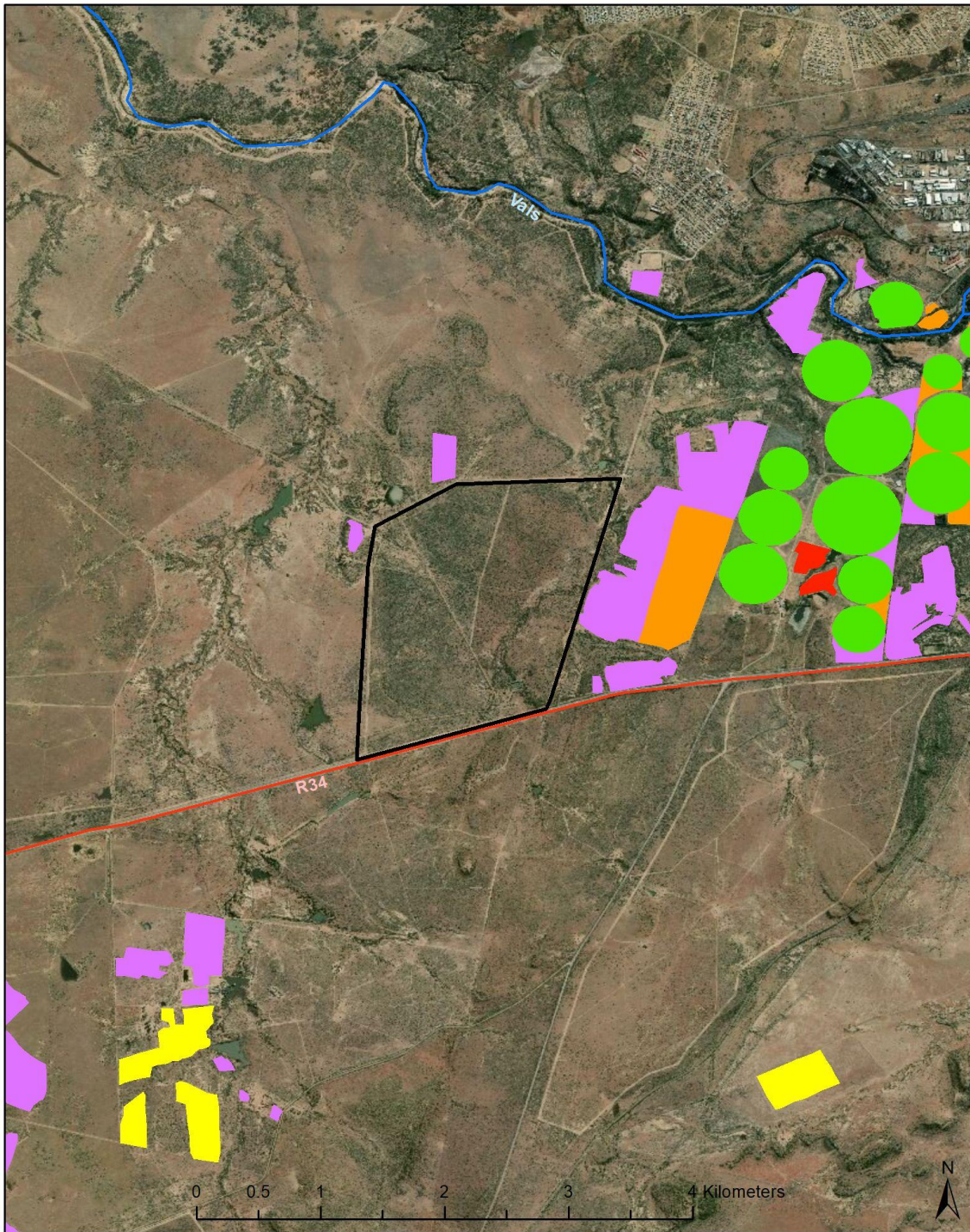
- 04. Low-Very low
- 05. Low
- 06. Low-Moderate

- 07. Low-Moderate
- 08. Moderate
- 09. Moderate-High

- PV development area (299.7 ha)
- Road
- Rivers



Figure 2 Land capability classification of the proposed Rondavel Solar PV Facility



Legend

Field crops

- Horticulture
- Non-pivot irrigated Annual Crop Cultivation / Planted Pastures
- Old Fields
- Pivot Irrigation
- Rainfed Annual Crop Cultivation / Planted Pastures

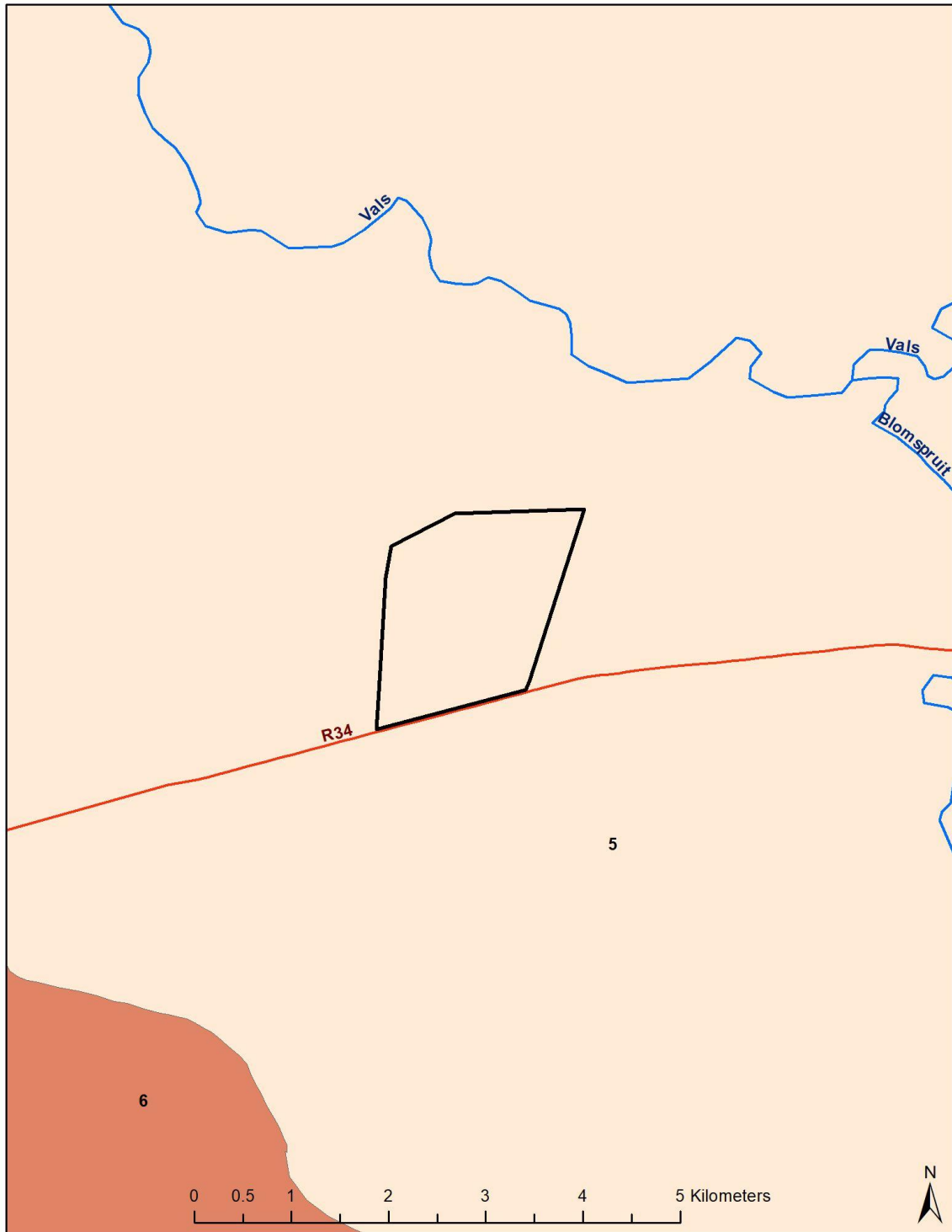
PV development area (299.7 ha)

- Road
- Rivers



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Figure 3 Locality of field crops around the development area of the Rondavel Solar PV Facility



Legend

Grazing capacity (ha/LSU)

- 5
- 6

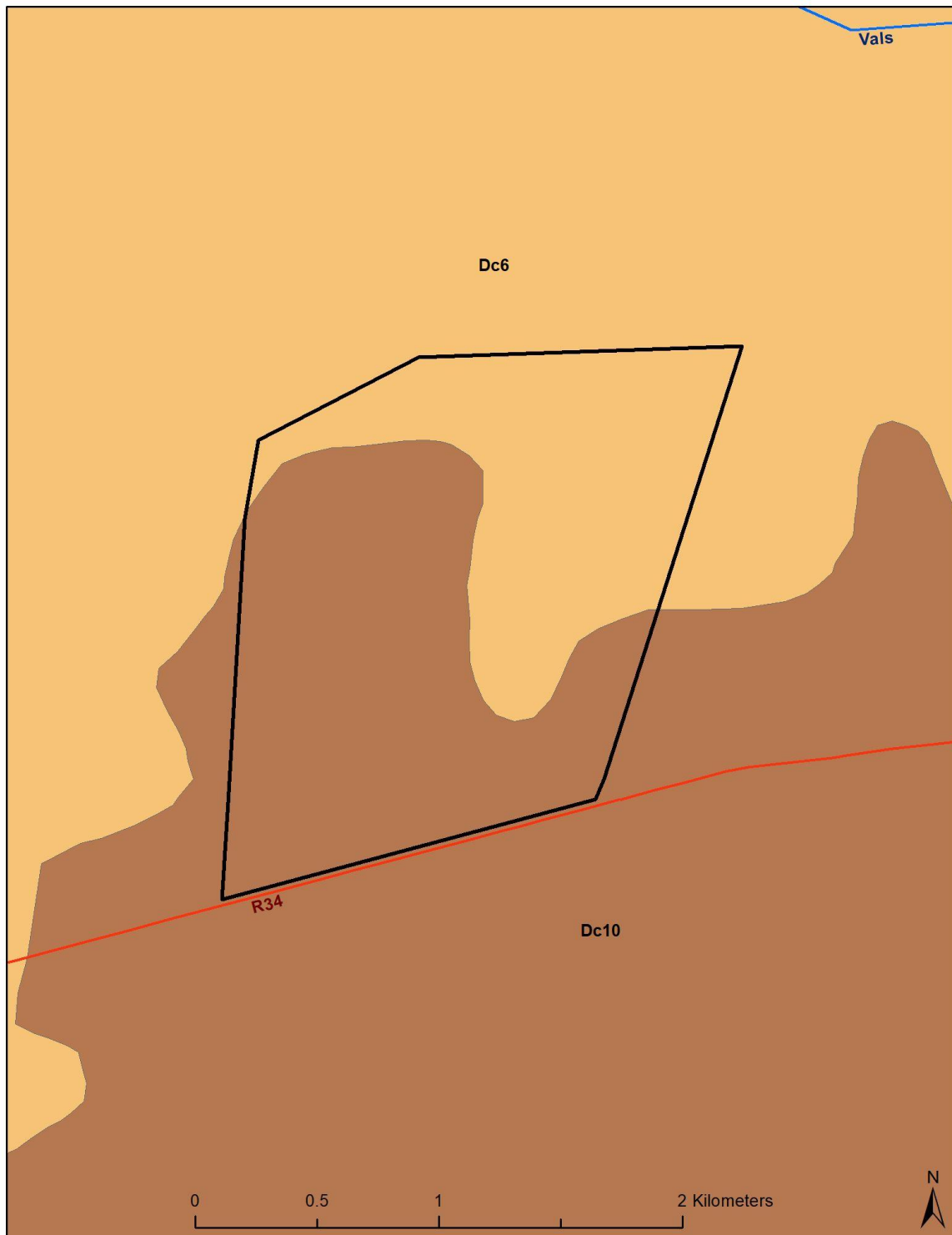
PV development area (299.7 ha)

Road

Rivers



Figure 4 Long-term grazing capacity of the proposed development area of the Rondavel Solar PV Facility



Legend

- | | |
|--|--|
| Land type |  PV development area (299.7 ha) |
|  Dc10 |  Road |
|  Dc6 |  Rivers |



Figure 5 Land type classification of the proposed development area of the Rondavel Solar PV Facility

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 DAFF, the grazing capacity of the entire development area, is 5 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.

4.4 Land type classification

The development area consists of two Land Types namely Land Types Dc6 and Dc10. The characteristics of the land types are described below and their positions in the landscape are depicted in Figure 5.

Land Type Dc6

Land Type Dc6 consists of four terrain units and the landscape can be described as undulating with slopes ranging between 0 and 12% (Figure 6). The soil formed from sandstone, grit and shale. The crest (Terrain Unit 1) is dominated by rock and shallow Mispah and Glenrosa soil forms (0.1 – 0.2m). The texture of soil in this terrain unit is dominated by sand-clay-loam with the clay fraction estimated as 15 - 35%.

Terrain unit 3 (mid-slope) forms 45% of land type Dc6. The mid-slope consists of rock and shallow Mispah and Glenrosa soil forms (0.1 – 0.2m), Valsrivier soil form (0.1 – 0.3m), Bonheim soil form (0.3 – 0.58m) and Mayo soil form (0.2 – 0.4m). The toe slope (Terrain Unit 4) is dominated by the shallow Valsrivier soil form. Mispah, Bonheim, Sterkspruit and Arcadia soil forms are also present in the toe slope. Terrain Unit 5 (Valley bottom) consists of Inhoek, Arcadia, Willowbrook, Mayo, Bonheim and Valsrivier soil forms. The soil depth ranges from 0.1m (Valsrivier) to >1.2m (Inhoek). The clay content ranges from 15 – 65% and the texture ranges from sand-clay-loam to clay.

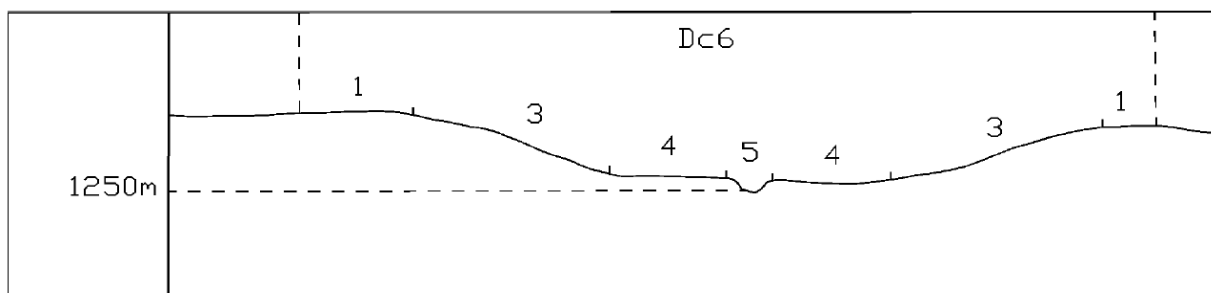


Figure 6 Terrain form sketch of Land Type Dc6

Land Type Dc10

Land Type Dc10 comprise of five terrain units where Terrain Units 1, 3 and 4 which dominate the landscape (93%) represent an undulating landscape (**Figure 7**). Terrain Unit 5 are the areas of slight depression at the valley bottoms with a slope of 1 – 2%. Terrain Unit 2 (upper slope) has steep slopes of >100% but represent only 1% of the Land Type. Terrain Unit 3 (lower slope) has a slope of 4 – 12% while the slopes of the other terrain units (crest and toe slope) range between 1 and 5%. The soil originated on the crests and scarps (upper slopes) from dolerite or sandstone and the mid slopes and toe slopes mainly from mudstone and shale.

The texture of soil in this land type is dominated by sandy clay and clay on the mid slope and toe slope with the clay ranging between 15 and 30%. Terrain Units 3 and 4 that represent 71% of this land type mainly consists of rock, shallow soil profiles (0.1 – 0.3m) of the Swartland and Mispah forms with an estimated 7 - 12% of areas in these terrain units consisting of deeper soil profiles (0.3 – 0.58m) of the Bonheim form. The valley bottoms are dominated by deep soil profiles (>1.2m) of the Dundee and Inhoek soil forms.

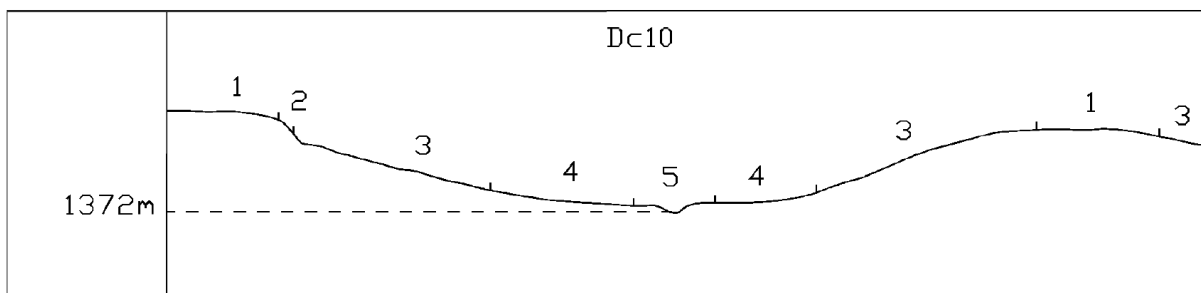


Figure 7 Depiction of the terrain forms of Land Type Dc10

5. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

5.1 Project description

The project will entail the construction and operation of a 100 MW Rondavel Solar PV Facility and associated Battery Energy Storage System (BESS). The development area will be approximately 300 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 <ul style="list-style-type: none"> 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 as a result 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 <ul style="list-style-type: none"> 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 PV 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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. 			

Potential impacts on agriculture

The proposed Rondavel SEF project will cause the land use to change from agriculture (cattle farming) to that of 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 activity			
Issue	Nature of Impact	Extent of Impact	No-Go Areas
The proposed project will 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 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 known how many agricultural jobs are made possible by the agricultural activities within the proposed Rondavel SEF development area. This will be investigated through informal discussions with the current landowner (or person/entity leasing the land for agricultural production)

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 to moderate land capability and the proposed project will reduce the land capability of the surface infrastructure footprint.			
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 Rondavel SEF. The area to be surveyed is the development area of 300 ha. This area includes for the proposed surface footprint as well as a 50m buffered area around it.

The area will be surveyed according to planned survey point as indicated in **Error! Reference source not found.** 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
- Evaluate the land for any signs of existing land degradation.
- Photographic evidence will be collected of the agricultural features of the site.

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 Rondavel Solar Energy Facility. The productivity and employment

data will be gathered through discussion sessions with the land owners 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 Rondavel Solar PV Facility will be within the allowable development limits for renewable energy developments or where it exceeds it.

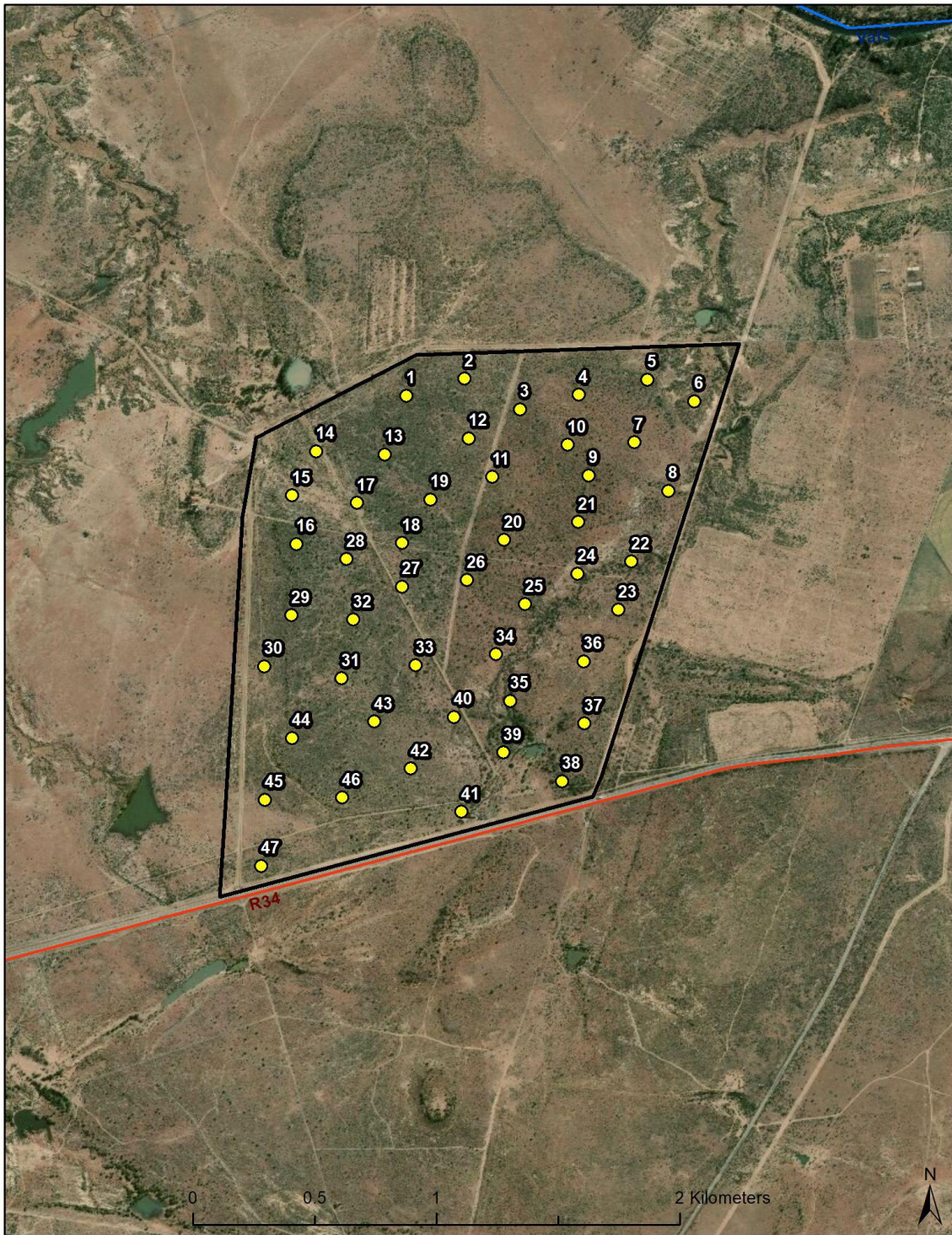
The report will be prepared in alignment with all the relevant NEMA regulations as well as General Notice 320 of 2020 that specifically address Agricultural Compliance reporting for the renewable energy sector.

7. CONCLUSION

Following the desktop analysis of available data, it is concluded that the proposed development of the Rondavel Solar PV Facility and supporting infrastructure, will affect land with low to moderate land capability. Soil in the area include soils with higher clay content and structure such as that of the Bonheim, Valsrivier and Arcadia forms, shallower soil forms underlain by rock (Mispah form) and partly weathered parent bedrock (Glenrosa form) as well as melanic soils of the Inhoek and Mayo forms.

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 medium impact on the soil properties and land capability while the agricultural productivity of the area will be reduced as a result of the land use change from livestock farming to generation of renewable energy. The detailed assessment and subsequent reporting during the EIA phase will provide in-depth detail on the sensitivity of the development area as well as the anticipated impacts.



Legend

- PV development area (299.7 ha)
- Planned survey points
- Road
- Rivers



Figure 8 Planned survey points on the proposed development area of the Rondavel Solar Energy Facility

8. LIST OF REFERENCES

- Crop Estimates Consortium, 2019. *Field crop boundary data layer (FS province)*, 2019. Pretoria. Department of Agriculture, Forestry and Fisheries.
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