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Agricultural Assessment for the Proposed Highveld Solar PV Facility

Submitted by TerraAfrica Consult cc

Mariné Pienaar

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1. Introduction

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd (Savannah) to conduct the Agricultural Assessment for the proposed Highveld Solar PV Facility (from here onwards also referred to as the project). The project applicant is WKN Windcurrent SA (Pty) Ltd. The proposed solar photovoltaic (PV) facility will have a generating capacity of up to 240MW.

The Highveld Solar PV Facility is located within the Klerksdorp Renewable Energy Development Zone (REDZ). The proposed development will be located approximately 15 km south west of the town Stilfontein in the North West Province (see Figure 1). The project site is located within the JB Marks Local Municipality and the Dr Kenneth Kaunda District Municipality. Access to the PV development area is provided via the N12 which is located to the south of the development area and the R30 which is located to the west of the Highveld Solar PV Facility.

The project site of proposed PV facility comprises about 1400ha that includes the following properties:

- Portion 10 of Farm Rietfontein 388
- Portion 11 of Farm Rietfontein 388
- Portion 56 of Farm Rietfontein 388
- Remainder of Farm Rietfontein 3

Access to the development area will be via an existing road that will be upgraded. From the perspective of agriculture and soil, it is not anticipated that the road upgrade will result in any new impacts or impacts with increased significance.

2. Details of the specialist

The report is prepared by Mariné Pienaar of TerraAfrica Consult CC. Mariné is a scientist registered with the South African Council for Natural Scientific Professions (SACNASP) and is specialised in the fields of Agricultural Science and Soil Science. Her SACNASP Registration Number is 400274/10 (see Appendix 2). Mariné holds a BSc. degree in Agricultural Science (with specialisation in Plant Production) from the University of Pretoria and a MSc. Degree in Environmental Science from the University of the Witwatersrand. She has completed more than ninety (90) assessments on renewable energy projects in her consulting career.

The full details and contact details of the specialist is attached as Appendix 1 – Specialist Declaration of Independence.

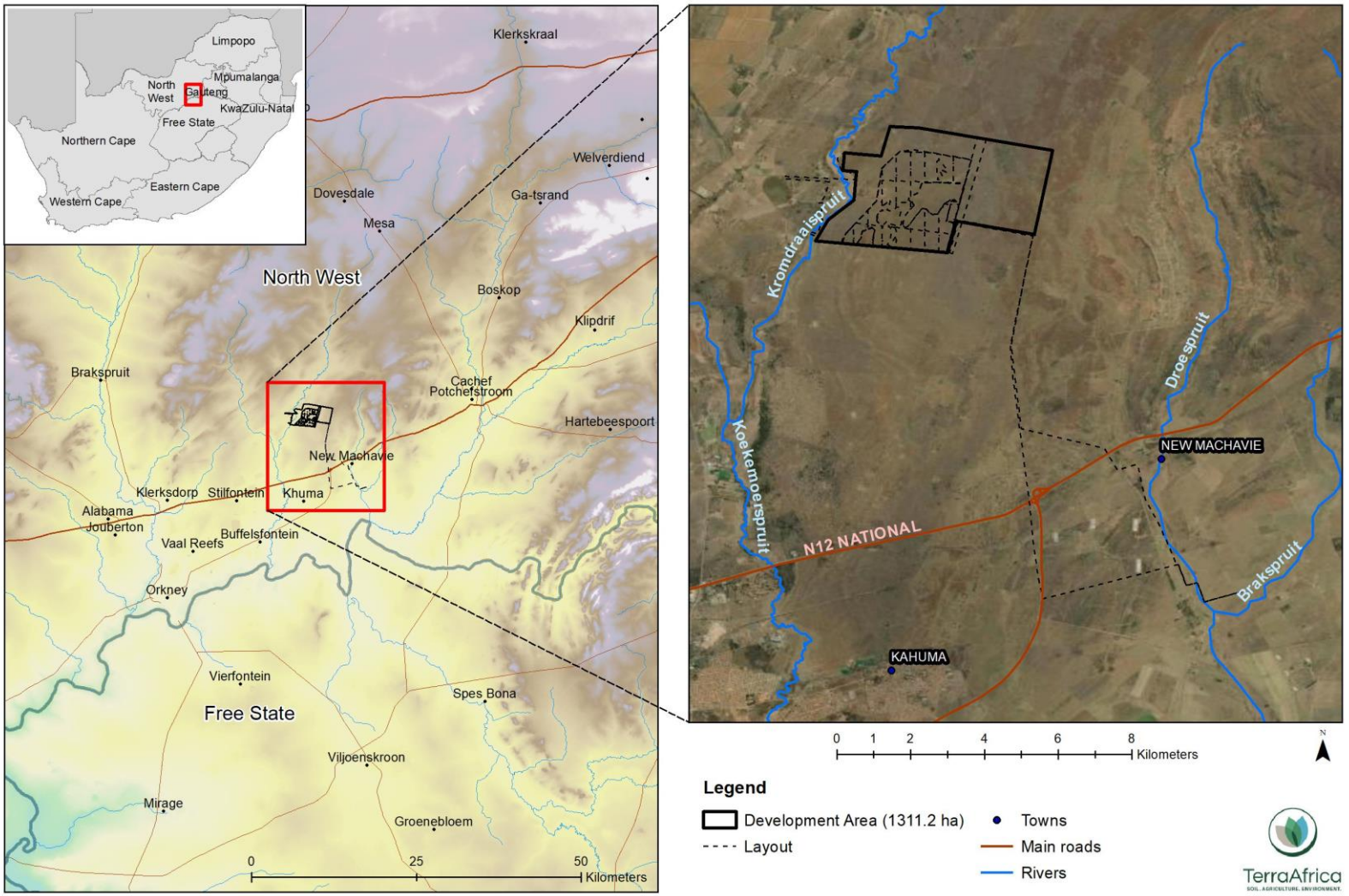

Figure 1: Locality of the proposed Highveld Solar PV Facility near Stilfontein, North West Province

3. Legislative framework of the assessment

The report follows the protocols as stipulated for agricultural assessment in Government Notice 320 of 2020 (GNR 320). This Notice provides the procedures and minimum criteria for reporting in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (No. 107 of 1998) (NEMA). It replaces the previous requirements of Appendix 6 of the Environmental Impact Assessment Regulations of NEMA.

In addition to the specific requirements of GN320 for this study, the following South African legislation is also considered applicable to the interpretation of the data and conclusions made with regards to environmental sensitivity and the conservation of soil resources of the project area:

- the Conservation of Agricultural Resources Act (No 43 of 1983) (CARA) states that the degradation of the agricultural potential of soil is illegal. CARA requires the protection of land against soil erosion and the prevention of water logging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed; and
- the National Water Act (No 36 of 1998) (NWA) deals with the protection of water resources (i.e. wetlands and rivers). Hydric soils with wetland land capability are not part of the proposed development area and the NWA is therefore not applicable.

4. Purpose and objectives of the assessment

The purpose of the Agricultural Assessment, is to ensure that the sensitivity of the site from the perspective of agricultural production to the proposed development, is sufficiently considered. To meet this objective, site sensitivity verification must be conducted, of which the results must meet the following objectives (as stipulated by GNR 320):

- It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool.
- It must contain proof in the form of photographs of the current land use and environmental sensitivity pertaining to the study field.
- All data and conclusions are submitted together with the Environmental Impact Assessment Report (prepared in accordance with the NEMA regulations) for the proposed project.

According to GNR 320, the agricultural compliance statement that is submitted must meet the following requirements, it must:

- be applicable to the preferred site and the proposed development footprint;
- confirm that the site is of “low” or “medium” sensitivity for agriculture; and
- indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.

The following checklist is supplied as per the requirements of GNR 320, detailing where in the report the various requirements have been addressed:

Table 1: GNR 320 requirements of an Agricultural Compliance Statement (Low to Medium Sensitivity)

Requirement	**Report reference**
3.1. The compliance statement must be prepared by a soil scientist or agricultural specialist registered with the SACNASP.	Section 2 & Appendix 2
3.2. The compliance statement must: 3.2.1. be applicable to the preferred site and proposed development footprint;	Section 9
3.2.2. confirm that the site is of "low" or "medium" sensitivity for agriculture; and	Section 9.5
3.2.3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.	Section 12
3.3. The compliance statement must contain, as a minimum, the following information: 3.3.1. details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;	Section 2, Appendices 1, 2 and 3
3.3.2. a signed statement of independence by the specialist;	Appendix 1
3.3.3. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	Figure 2
3.3.4 calculations of the physical development footprint area for each land parcel as well as the total physical development footprint area of the proposed development including supporting infrastructure;	Section 1
3.3.5 confirmation that the development footprint is in line with the allowable development limits;	Section 9.6
3.3.6. confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities;	Section 10.1
3.3.7. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development;	Section 12
3.3.8. any conditions to which the statement is subjected;	Section 12
3.3.9. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	Not applicable
3.3.10. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	Section 11
3.3.11. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data.	Section 8
3.4. A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	To be submitted as part of Basic

	Assessment report

5. Terms of Reference

In addition to the requirements stipulated in GNR 320, the following Terms of Reference, as stipulated by Savannah, apply to the Agricultural Compliance Statement:

- to ensure a thorough assessment, that includes both the desktop assessment of databases and aerial photography; a description of the on-site verification of the agricultural potential of the area; and the soil forms present in the development area;
- identify and assess potential impacts on both agricultural potential and soil resulting from the proposed project;
- identify and describe potential cumulative soil, agricultural potential and land capability impacts resulting from the proposed project in relation to proposed and existing developments in the surrounding area; and
- recommend mitigation, management and monitoring measures, to minimise impacts and/or optimise benefits associated with the proposed project.

6. Agricultural Sensitivity

The combined Agricultural Sensitivity of the proposed project area was determined by using the National Environmental Screening Tool (www.screening.environment.gov.za). The screening report was generated by Savannah on 15 March 2022. The requirements of GNR 320 stipulate that a 50m buffered development envelope must be assessed with the screening tool. The map depicted in Figure **2** shows the agricultural sensitivity of the entire development area of about 1300ha as well as a buffered area of at least 4km around the proposed development area. The results provided by the screening tool indicate that more than 90% of the development area consists of land with Medium agricultural sensitivity (refer to Figure **2**). A narrow, vertical strip of land running through the middle of the development area is shown as High agricultural sensitivity. The north western corner of the site has two very small patches of land with High sensitivity as well as a very small area with Low sensitivity.

In alignment with the CARA, the Department of Agriculture, Land Reform and Rural Development (DALRRD) developed spatial data that depict High Potential Agricultural Areas (HPAAs) of the different provinces of South Africa (DALRRD, 2019). According to the DALRRD, these areas can be defined as: *"large, relative homogeneous portions of high value agricultural land that has the potential to sustainably, in the long-term, contribute significantly to the production of food.*" Category A areas are considered the most important areas to conserve, followed by Category B, etc. with lower conservation priority.

The data layer of the HPAA's of North West Province shows that the proposed project area falls outside of any HPAA (refer to Figure **3**). According to this data, approximately 70% of the development area falls within a Category B rainfed HPAA (RF). The development area is located about 10km north west of a Category B irrigated HPAA (IR).

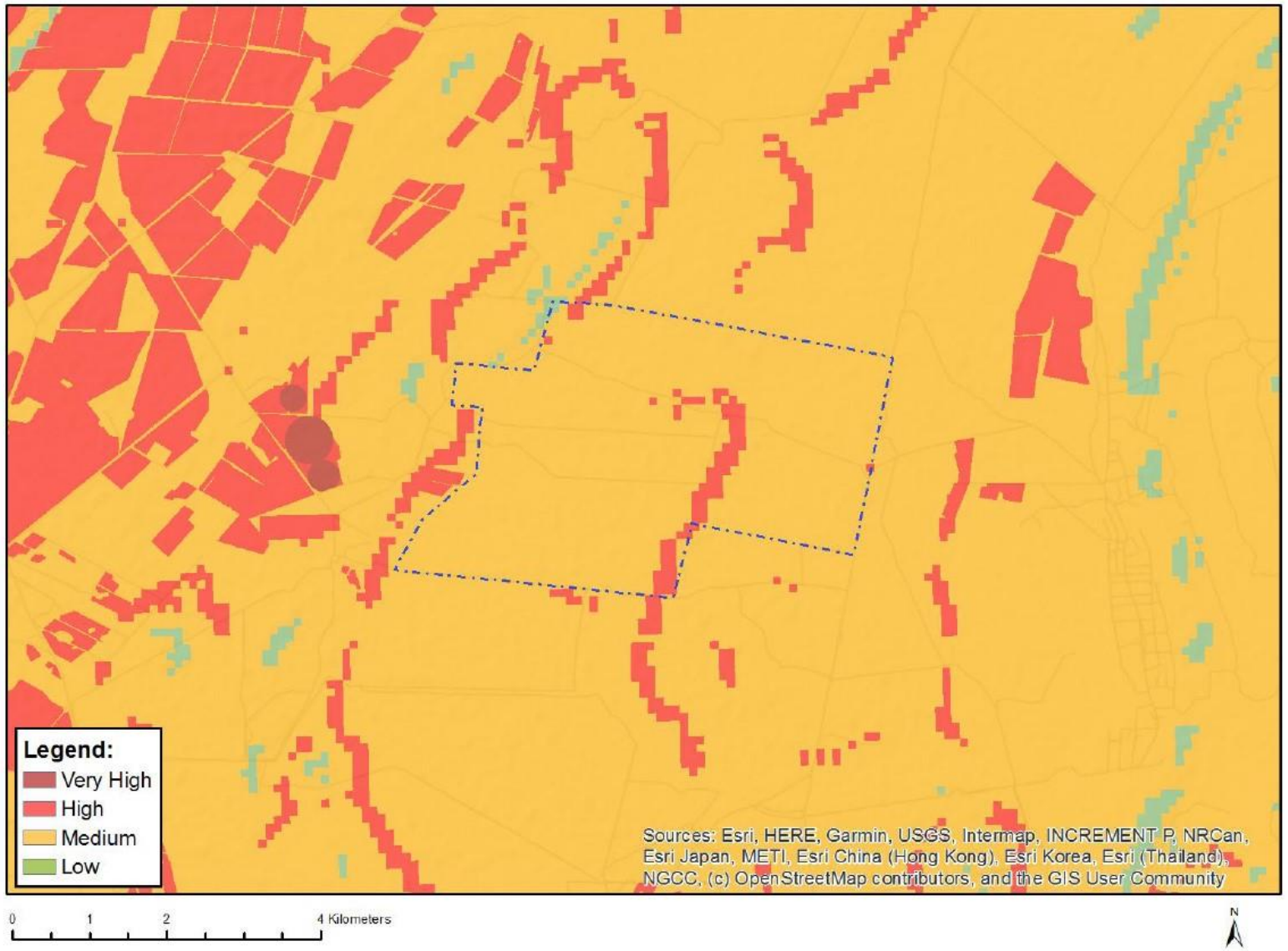

Figure 2 Agricultural Combined Sensitivity of the Highveld Solar PV Facility development area (generated by Savannah Environmental, March 2022)

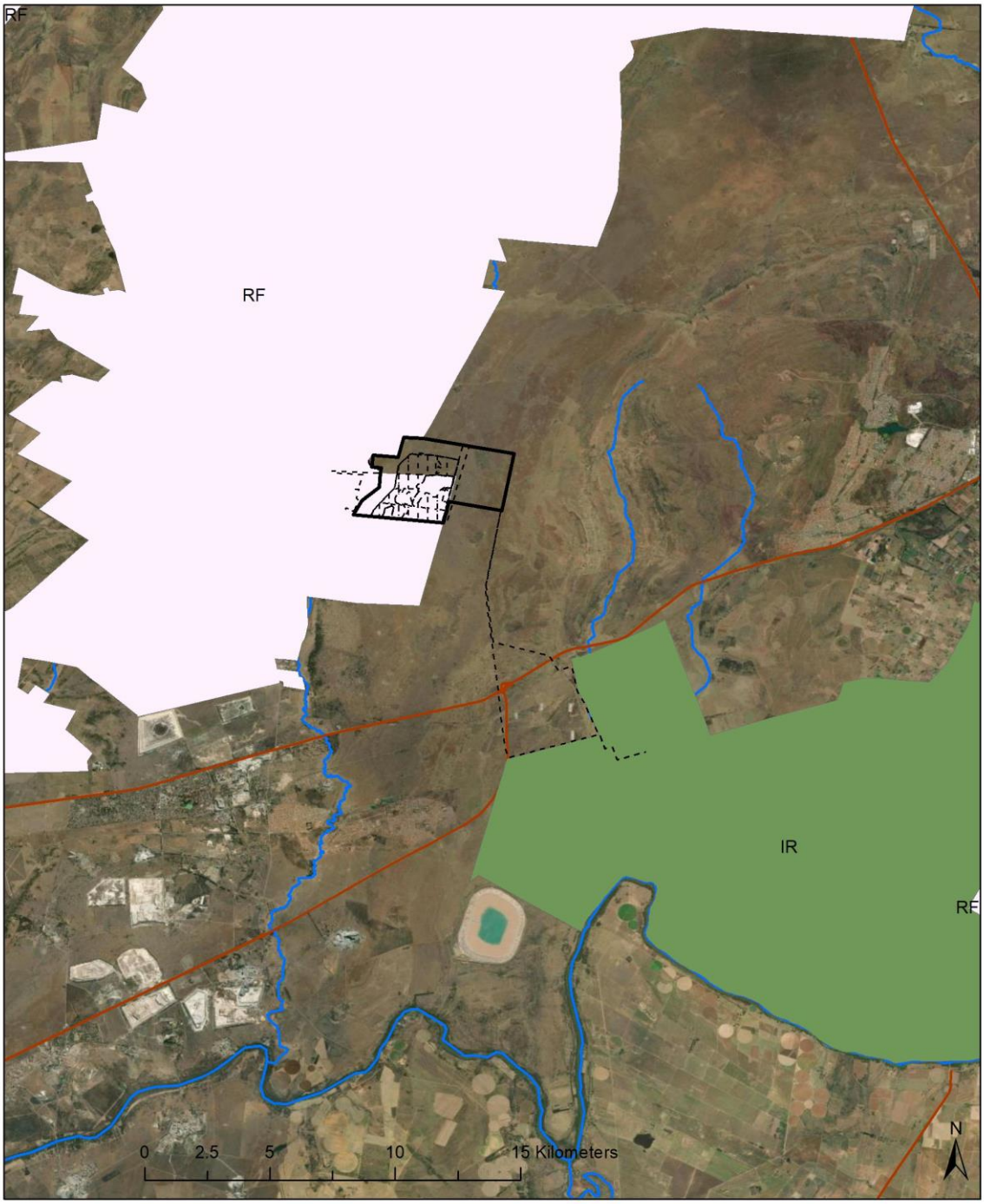

Figure 3 Presence of High Potential Agricultural Areas around the Highveld Solar PV Facility development area (DALRRD, 2019)

7. Methodology

The different steps that were followed to gather the information used for the compilation of this report is outlined below. The methodology is in alignment with the requirements of GNR 320.

7.1 Assessment of available data

The most recent aerial photography of the area available from Google Earth was obtained. The satellite imagery was used to analyse the terrain of the proposed project area and the surrounding area. The analysis considered the slope, typical terrain units and landscape features, such as existing roads, farm infrastructure and areas where land degradation may be present. The proposed development area was also superimposed on five different raster data sets obtained from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) and the ARC (land type data). The data sets are:

- Land type data for the project assessment zone 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.
- The Refined Land Capability Evaluation Raster Data for South Africa that was developed using a spatial evaluation modelling approach (DALRRD, 2016).
- The long-term grazing capacity for South Africa 2018 that present the long term grazing capacity of an area with the understanding that the veld is in a relatively good condition (South Africa, 2018).
- The North West Field Crop Boundaries show crop production areas may be present within the development area. The field crop boundaries include rainfed annual crops, non-pivot and pivot irrigated annual crops, horticulture, viticulture, old fields, small holdings and subsistence farming (DALRRD, 2019).
- The High Potential Agricultural Areas for Cultivation: North West Province, 2019 are large, relatively homogeneous areas of land within the province regarded as having high potential and capability to contribute towards food production in both the province and the country (DALRRD, 2019).

7.2 Site assessment

The site visit was conducted on 20 and 21 October 2022. The soil profiles within the proposed development footprint were examined to a maximum depth of 1.5m using a hand-held auger. Observations on site were made regarding soil texture, structure, colour and soil depth at each survey point. The locality of each survey point is shown in Figure 4. A cold 10% hydrochloric acid solution was used on site to test for the presence of carbonates in the soil. A hand-held Garmin GPS was used to the log the coordinates of each of the survey points. The soils are described using Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018).

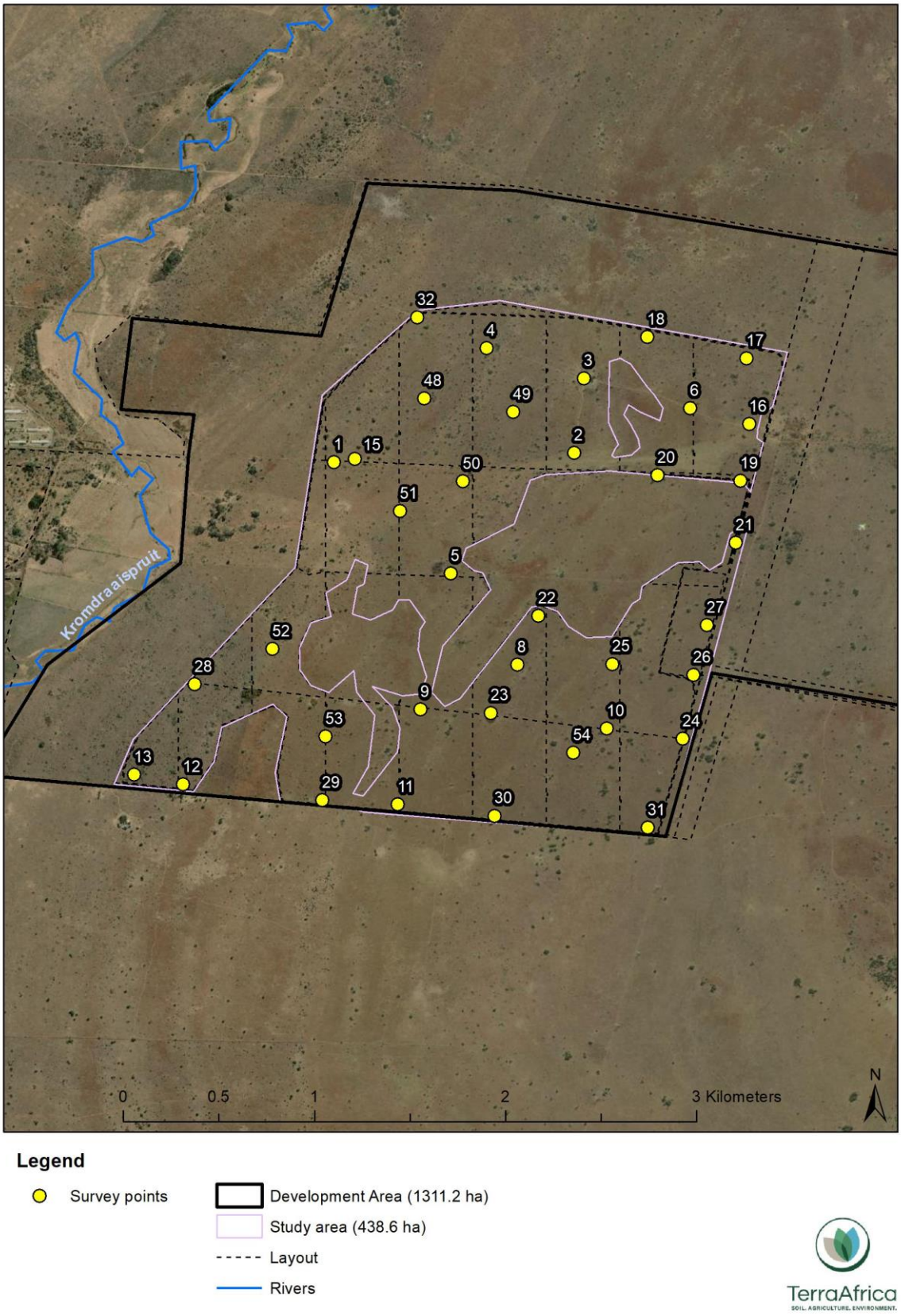

Figure 4 Locality of on-site soil classification and observation points within the development footprint of the proposed Highveld Solar PV Facility

Other observations made during the site visit include recording the presence of farm buildings, cattle handling facilities and water troughs. The larger area around the study area was also assessed by driving through the area to gain an understanding of the agro-ecosystem within which the study area functions. Photographic evidence of soil properties, current land uses and farm infrastructure were taken with a digital camera and presented in Section 9 of the report.

7.3 Impact assessment methodology

Following the methodology prescribed by Savannah, the direct, indirect and cumulative impacts associated with the project have been assessed in terms of the following criteria:

- the **nature**, including a description of what causes the effect, what will be affected and how it will be affected;
- the **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional; and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high);
- the **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- the **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment; 2 is minor and will not result in an impact on processes; 4 is low and will cause a slight impact on processes; 6 is moderate and will result in processes continuing but in a modified way; 8 is high (processes are altered to the extent that they temporarily cease); and 10 is very high and results in complete destruction of patterns and permanent cessation of processes;
- the **probability** *of occurrence*, describing the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures);
- the **significance**, determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;
- the **status**, described as either positive, negative or neutral;
- the degree to which the impact can be reversed;
- the degree to which the impact may cause irreplaceable loss of resources; and
- the *degree* to which the impact can be *mitigated.*

The **significance** is calculated by combining the criteria in the following formula:

$$S=(E+D+M)P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated); and
- 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

8. Study gaps, limitations and assumptions

All assumptions made with the interpretation of the baseline results and anticipated impacts, are listed below:

- it is assumed that the infrastructure will be positioned within the study area indicated for the development footprint and that was assessed in this report;
- it is also assumed that the grid connection solution will be part of a separate Environmental Authorisation process;
- it is assumed that the development footprint will be fenced off and excluded as land available for any future farming activities; and
- it is further assumed that the activities for the construction and operation of the infrastructure are limited to that typical for the construction and operation of a solar PV facility, inclusive of the infrastructure listed in Section 10.1.

The following limitations is part of the assessment:

- the anticipation and rating of impacts are based on the report author's knowledge and experience on the nature of construction and operation of grid infrastructure. Therefore, it is done as accurately as possible but must not be considered as absolute measures.

No other information gaps, limitations and assumptions have been identified.

9. Baseline description

9.1 Soil properties

The soils identified within the development footprint consist of the Mispah, Glenrosa and Vaalbos forms. The distribution of the soil forms is depicted in Figure 5 and a description of each soil form is provided following Figure 5.

Figure 5 Soil classification map of the Highveld Solar PV Facility development area

Mispah soils

The Mispah soils are present at 415.1ha of the development footprint assessed. These are the dominant soils of the area. The Mispah soils are very shallow, ranging in effective depth between 0.05 and 0.30m. The Mispah soils consist of orthic topsoil (mostly bleached) that covers fractured and solid rock (see Figure 6). In some areas, such as the existing farm roads of the properties, solid rock is visible on the surface as rock outcrops (as shown in Figure 7).

Figure 6 Photographic evidence of a Mispah soil profile within the development footprint

Figure 7 Solid rock boulders visible along existing farm roads

Vaalbos soils

One area of approximately 11.4ha consists of the Vaalbos soil form. The Vaalbos soils are present in the north-eastern part of the development footprint. The Vaalbos soils consist of chromic (red) topsoil with sandy-loam texture that overlies a red apedal horizon. The red apedal horizon is limited in soil depth by the presence of fractured hard rock. The effective soil depth of the Vaalbos profiles is 0.45m.

Figure 8 Photographic evidence of Vaalbos soils within the development footprint

Glenrosa soils

One area of 12ha of Glenrosa soils is present directly north of the Vaalbos soils. The average effective depth of the Glenrosa soils range in depth between 0.10m and 0.30m and consist of orthic topsoil horizons that are either bleached or chromic (light red in colour) with lithic material underneath (see Figure 9). The lithic horizon of the Glenrosa soils within the Highveld PV development footprint area belongs to the geolithic family and consists of soil material as illuvial infillings between partly weathered and fractured rock (Soil Classification Working Group, 2018).

Figure 9 Photographic example of the Glenrosa soils

9.2 Land capability

Following the soil classification of the development footprint, the soils present were assigned into land capability classes. The very shallow soils of the largest part of the development footprint (Mispah soil form) has Very low (Class 03) land capability. The slightly deeper soils of the Glenrosa and Vaalbos forms have been assigned Low (Class 05) land capability. The position of the different land capability classes within the development area and grid connection alternatives, are depicted in Figure 10.

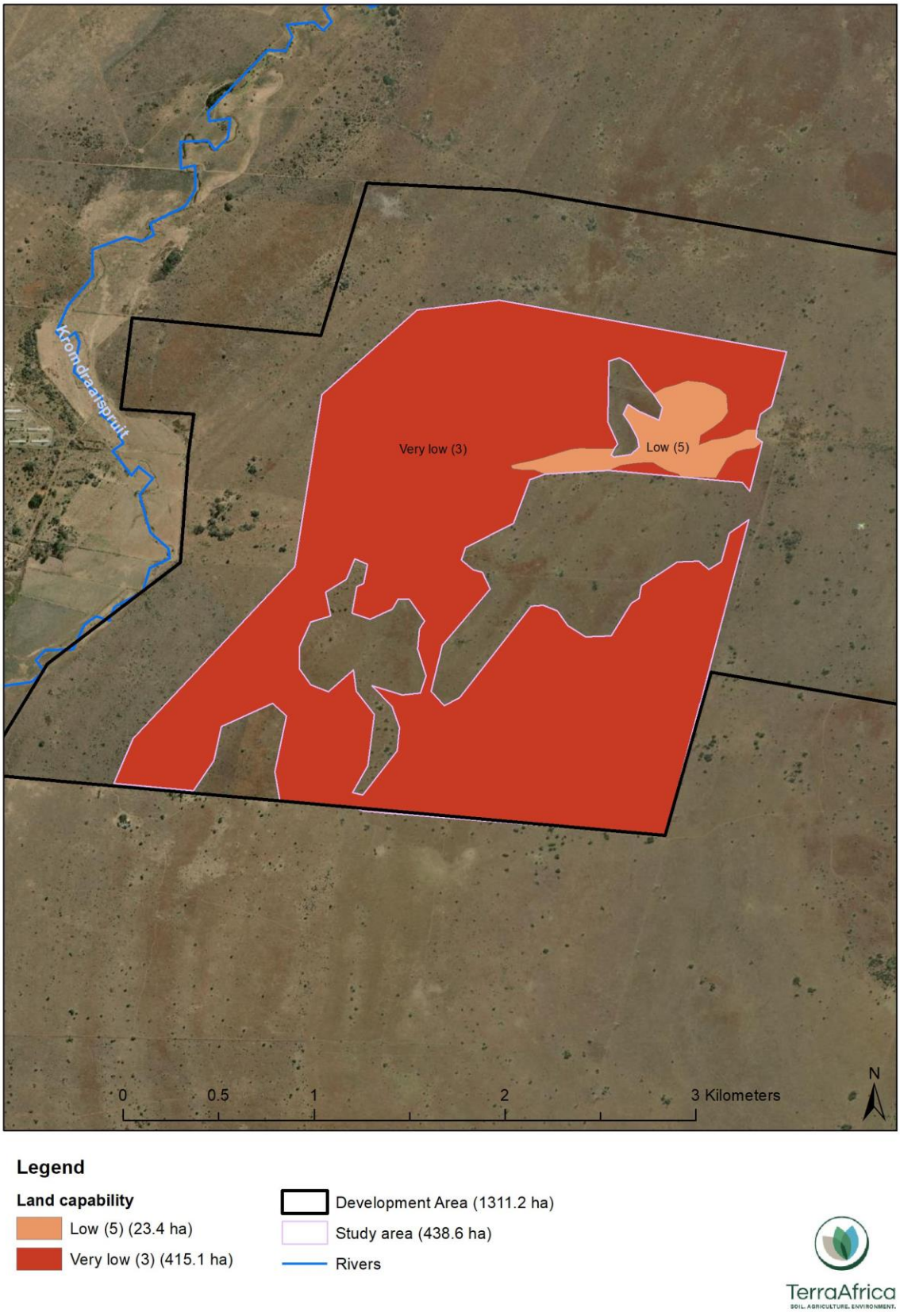

Figure 10 Land capability classification of the Highveld Solar PV Facility development footprint area

9.3 Agricultural potential

Following the classification of the soil and the consideration of the soil properties and limiting factors to rainfed crop production, the agricultural potential soil within the development footprint was determined. The total development footprint area assessed, has Low agricultural potential for the production of rainfed crops. The main constraint to production is the shallow depth of the soil profiles and the presence of fractured rock, solid rock and lithic material at effective depths shallower than 0.5m. The area is considered better suited to extensive livestock production, which is also the current land use on site.

9.4 Land use

The entire development area (including the development footprint) is currently used for livestock grazing. Cattle watering facilities were observed during the site visit.

Figure 11 Livestock watering facility within the development footprint

Following the metadata layer obtained from DALRRD, the long-term grazing capacity of the entire development area is 6 ha/LSU (see Figure 12). 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) (DALRRD, 2018).

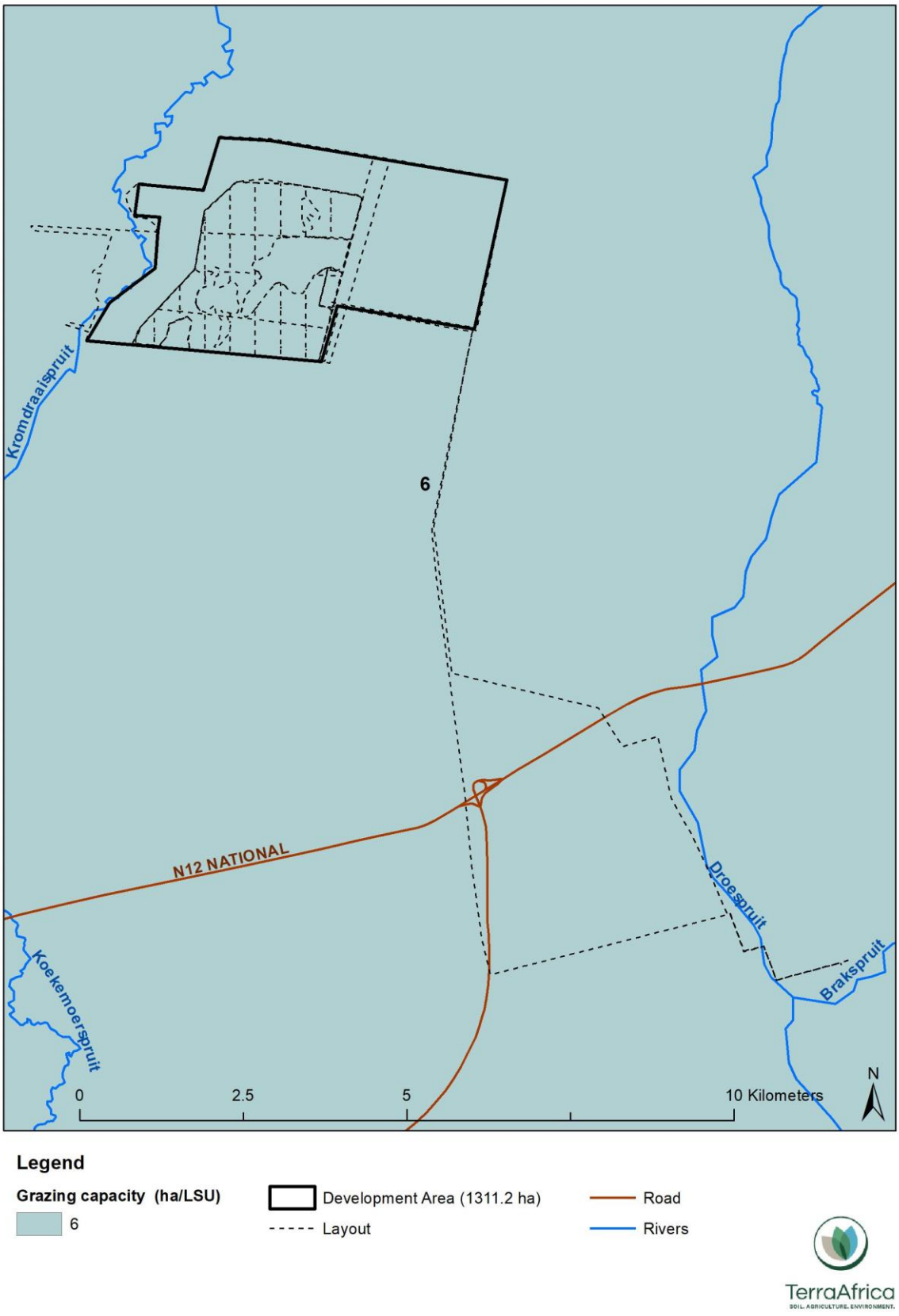

Figure 12 Grazing capacity of the proposed Highveld Solar PV Facility development area (data source: DALRRD, 2018)

Using the long-term grazing capacity of 6ha/LSU, the PV development footprint of up to 433ha can provide forage to 72 head of cattle. The grazing capacity is moderate-high in comparison to the grazing capacity of the rest of the country. The vegetation consists of a mixture of grasses as well as *Vachelia* and *Searsia* species. The grass cover shows signs of regular grazing and is sparse over large areas as a result of the shallow, rocky soils present.

The absence of crop production within the development area is confirmed by the absence of crop field boundaries within the Highveld Solar PV Facility development area (see Figure 13). The development area has also not historically been used for crop production. The nearest crop fields with rainfed annual crops and planted pastures are located directly west of the western boundary of the development area. Further west from the development area is a large cluster of crop fields with rainfed crops as well as a few centre pivot irrigation areas. A smaller cluster of fields with rainfed crops are located east of the development area and 10km south-east of it.

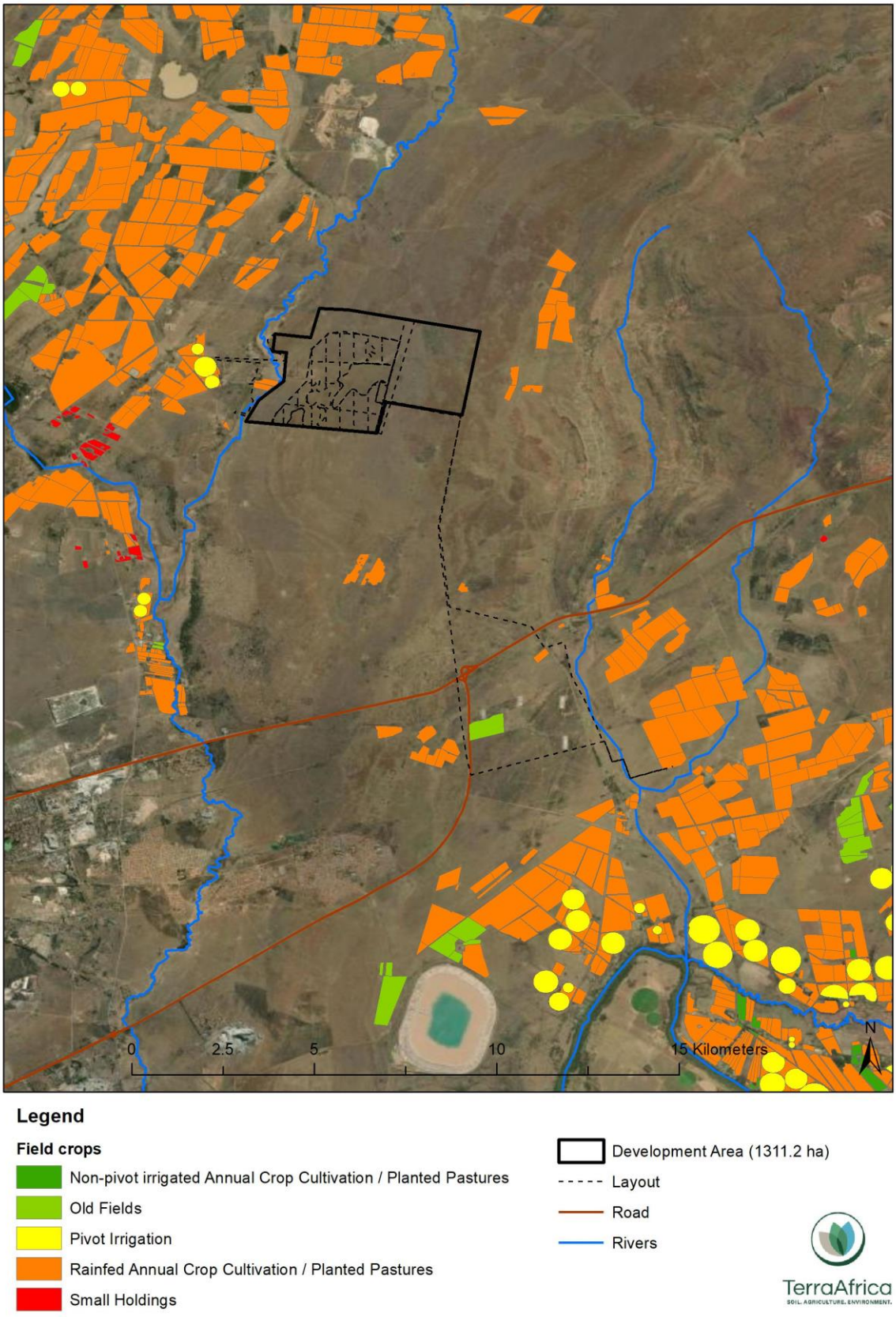

Figure 13 Location of field crop boundaries around the proposed Highveld Solar PV Facility development area (data source: DALRRD, 2019)

9.5 Sensitivity analysis

Following the consideration of all the desktop and gathered baseline data above, the findings of the report differ with the results of the Environmental Screening Tool. The soil forms present within the development footprint, are shallow to very soils that range in depth between 0.05 and 0.45m. Rock outcrops are present on the surface in several areas within the proposed development footprint. The area has not historically been used for crop production and also not recently, as confirmed by the field crop boundary data of DALRRD (2019) (see Figure 13). No irrigation infrastructure, such as centre pivots or drip irrigation, are present within the project area and irrigated agricultural is currently not practiced in the area.

The area is currently used for livestock farming and the proposed Highveld Solar PV Facility development footprint can support 72 head of cattle at the long-term grazing capacity of 8ha/LSU (DALRRD, 2018). Considering the soil properties, land capability and agricultural potential of the development area, the entire area has **Low Agricultural Sensitivity** (see Figure **14)**. Soil in the project area will have Low to Medium sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction and pollution. The significance of the impacts and mitigation measures proposed are discussed in **Section 10**.

9.6 Allowable development limits

Although the data layer of High Potential Agricultural Areas indicate that about 70% of the development footprint falls within an area that is classified as a Category B Rainfed High Potential Agricultural Area (DALRRD 2021), the site verification visit confirmed that there is no crop production within the entire development area. There was also no historical crop production within this area. The soil forms present are all shallow with the effective depth not deeper than 0.45m. It is therefore concluded that the entire proposed development footprint has Low agricultural sensitivity. It is therefore confirmed that the current layout and development footprint for the proposed Highveld Solar PV Facility, does not exceed the allowable development limits (Table 2).

Table 2 Calculated allowable development limits according to the confirmed project site senstivity

Sensitivity class	Area that will be affected by development footprint (ha)	Allowable limit (ha/MW)	Area allowed for a 240MW development (ha)	Area that exceeds allowable limit (ha)
Low	433ha	2.50	600	0

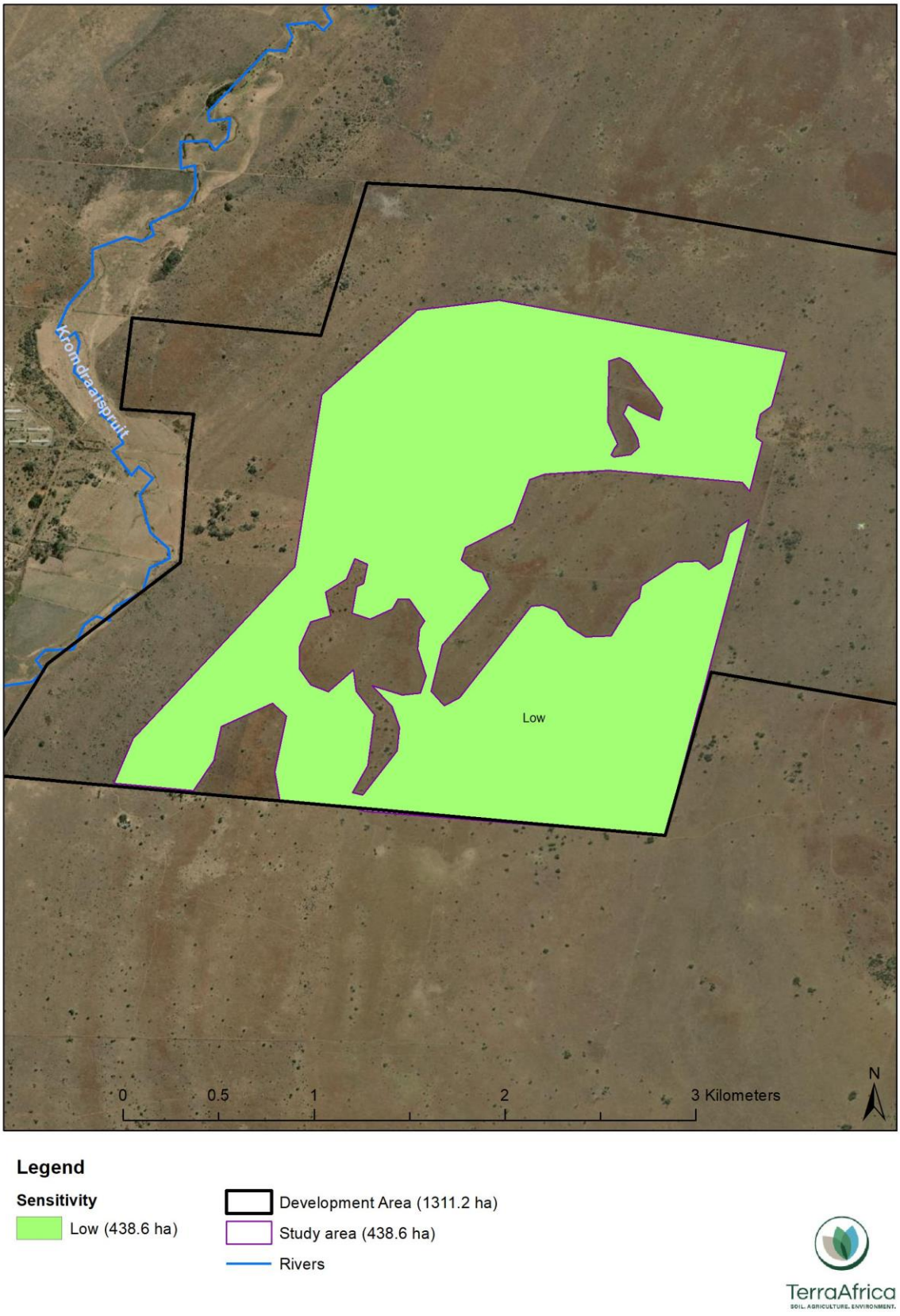

Figure 14 Agricultural sensitivity rating of the proposed Highveld Solar PV Facility development footprint area

10. Impact assessment

10.1 Project description

The proposed Highveld Solar PV Facility will have a generating capacity of up to 240MW. While the project site is approximately 1400ha in size and the development area about 1300ha, the development footprint will only affect 433ha.

The infrastructure associated with the proposed 240MW Highveld solar PV facility will include:

- Solar PV arrays, modules and mounting structures.
- Inverters and transformers.
- A Battery Energy Storage System (BESS)
- On-site facility substation
- Cabling between the project components
- Site and internal access roads and fencing around the development area
- Temporary and permanent laydown areas and O&M buildings.

The PV panels will have installed height of up to 5.5m from ground level. The on-site facility substation will be located within the development footprint and be approximately 1ha in extent. Existing roads will be used, wherever possible, to access the project site and development area. Access to the PV development area is provided via the N12 which is located to the south of the development area and the R30 which is located to the west of the Highveld Solar PV Facility. Internal roads up to 5m in width will be required to access the PV panels and on-site substation.

Prior to the finalisation of the infrastructure layout as depicted in Figure **15**, the layout went through a process of micro-siting that considered all the environmental sensitivities as communicated by the different specialists working on the project. This resulted in the exclusion of land along the western and northern boundaries of the development area as well as two isolated sections in the middle of the site. It can therefore be confirmed that the current layout does not result in the fragmentation of any crop fields and only affects grazing land with Low agricultural sensitivity.

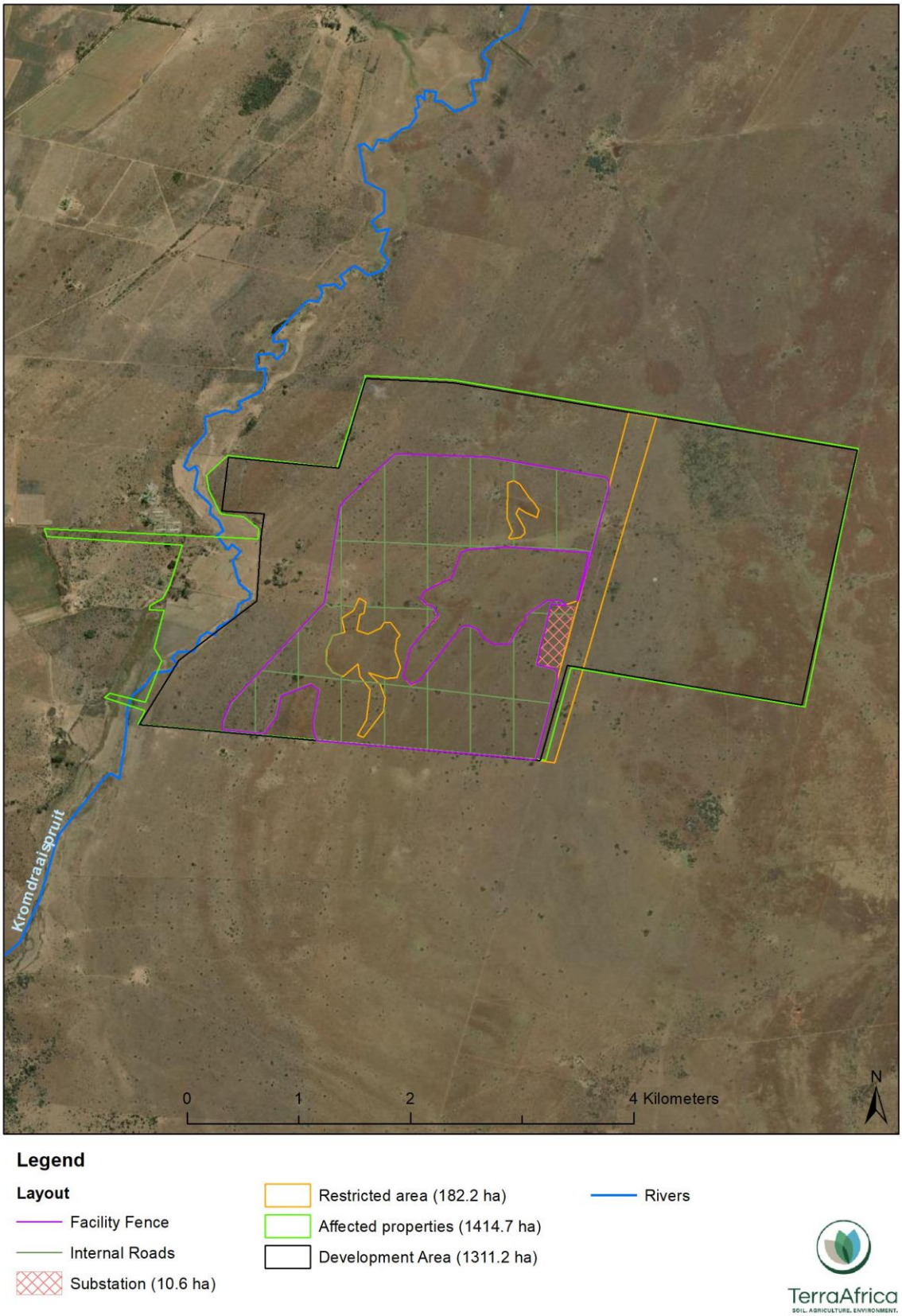

Figure 15 Layout of the Highveld Solar PV facility's infrastructure

10.2 Impact significance rating

The most significant impacts of the proposed project on soil and agricultural productivity will occur during the construction phase when the vegetation is removed and the soil surface is prepared for the delivery of materials and erection of the infrastructure. During the operational phase, the risk remains that soil will be polluted by the waste generated or in the case of a spill incident. During the decommissioning phase, soil will be prone to erosion when the infrastructure is removed from the soil surface.

Below follows the rating of the significance of each of the impacts for each of the project phases.

10.2.1 Construction phase

Impact: Change in land use from livestock farming to energy generation

Nature: Prior to construction of the project infrastructure, the PV development footprint will be fenced off and livestock farming will be excluded from up to 433ha of land.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium duration (3)	Medium duration (3)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (4)	Definite (4)
Significance	**Medium (40)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	N/A

Mitigation:

- Vegetation clearance must be restricted to areas where infrastructure is constructed.
- No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.
- Prior arrangements must be made with the landowners to ensure that livestock animals are moved to areas where they cannot be injured by vehicles traversing the area.
- No boundary fence must be opened without the landowners' permission.
- All left-over construction material must be removed from site once construction on a land portion is completed.
- No open fires made by the construction teams are allowable during the construction phase.

Residual Impacts:

The residual impact from the construction of the Highveld Solar PV Facility is considered medium.

Cumulative Impacts:

Any additional infrastructure development in support of the Highveld Solar PV Facility, will result in additional areas where grazing veld will be disturbed.

Impact: Soil erosion

Nature: All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk, as the area falls within a region that experiences thunderstorms in the summer months and sometimes strong winds during the dry winter months, especially August and September.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint; • Unnecessary land clearance must be avoided; • Level any remaining soil removed from excavation pits (where the PV modules will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface; • Where possible, conduct the construction activities outside of the rainy season; and • Stormwater channels must be designed to minimise soil erosion risk resulting from surface water runoff.		
Residual Impacts: The residual impact from the construction and operation of the project on the susceptibility to erosion is considered low.		
Cumulative Impacts: Any additional infrastructure development in support of the project will result in additional areas exposed to soil erosion through wind and water movement.		

Impact: Soil compaction

Nature: The clearing and levelling of land for construction of the infrastructure will result in soil compaction. In the area where the substation will be constructed, topsoil will be removed, and the remaining soil material will be deliberately compacted to ensure a stable surface prior to construction.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint; • Unnecessary land clearance must be avoided; • Materials must be off-loaded and stored in designated laydown areas; • Where possible, conduct the construction activities outside of the rainy season; and		

• Vehicles and equipment must park in designated parking areas.
Residual Impacts:
The residual impact from the construction and operation of the project on soil compaction is considered low.
Cumulative Impacts:
Any additional infrastructure development in support of the project, will result in additional areas exposed to soil compaction.

Impact: Soil pollution

During the construction phase, construction workers will access the land for the preparation of the terrain and the construction of the infrastructure. Potential spills and leaks from construction vehicles and equipment and waste generation on site can result in soil pollution.

Nature: The following construction activities can result in the chemical pollution of the soil:

1. Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation;
2. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site;
3. The accidental spills from temporary chemical toilets used by construction workers;
4. The generation of domestic waste by construction workers;
5. Spills from fuel storage tanks during construction;
6. Pollution from concrete mixing;
7. Pollution from road-building materials; and
8. Any construction material remaining within the construction area once construction is completed.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

- Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;
- Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams;
- Any left-over construction materials must be removed from site;
- The construction site must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping;
- Ensure battery transport and installation by accredited staff / contractors; and
- Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.

Residual Impacts:

The residual impact from the construction and operation of the proposed project will be low to negligible.

Cumulative Impacts:

Any additional infrastructure that will be constructed to strengthen and support the operation of the Highveld Solar PV facility and waste not removed to designated waste sites will increase the cumulative impacts associated with soil pollution in the area.

10.2.2 Operational phase

Impact: Soil erosion

During the operational phase, staff and maintenance personnel will access the project area daily. The following impacts on soil are expected for this phase:

Nature: The areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the project area.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • The area around the project, including the internal access roads, must regularly be monitored to detect early signs of soil erosion on-set; and • If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.		
Residual Impacts: The residual impact from the operation of the project on the susceptibility to erosion is considered low.		
Cumulative Impacts: Any additional infrastructure that will be constructed to strengthen and support the operation of the project will result in additional areas exposed to soil erosion through wind and water movement.		

Impact: Soil pollution

Nature: During the operational phase, potential spills and leaks from maintenance vehicles and equipment and waste generation on site can result in soil pollution. Also, any spillages around the workshop area or damaged infrastructure, such as inverters and transformers, can be a source of soil pollution.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills; • No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area; and		

• Regularly monitor areas alongside the roads, parking area and workshop for any signs of oil, grease and fuel spillage or the presence of waste.
Residual Impacts: The residual impact from the operation of the proposed project will be low to negligible.
Cumulative Impacts: The operation of any additional infrastructure to strengthen and support the operation of the Highveld Solar PV facility and waste not removed to designated waste sites will increase the cumulative impacts associated with soil pollution in the area.

10.2.3 Decommissioning phase

The decommissioning phase will have the same impacts as the construction phase i.e. soil erosion, soil compaction and soil pollution. It is anticipated that the risk of soil erosion will especially remain until the vegetation growth has re-established in the area where the project infrastructure was decommissioned.

10.3 Cumulative impact assessment and rating

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[1].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed project will result in:

- unacceptable risk;
- unacceptable loss;
- complete or whole-scale changes to the environment or sense of place; and
- unacceptable increase in impact.

In addition to the proposed Highveld Solar PV Facility, nine other renewable energy projects that were previously authorised, are located within a 50km radius from it. The position of the authorised projects in relation to the proposed project, is shown in Figure 16. The cumulative impacts of these renewable projects, when considered in comparison to the significance of impacts of the Highveld Solar PV Facility, are listed below.

[1] Unless otherwise stated, all definitions are from the EIA Regulations 2014 (GNR 326).

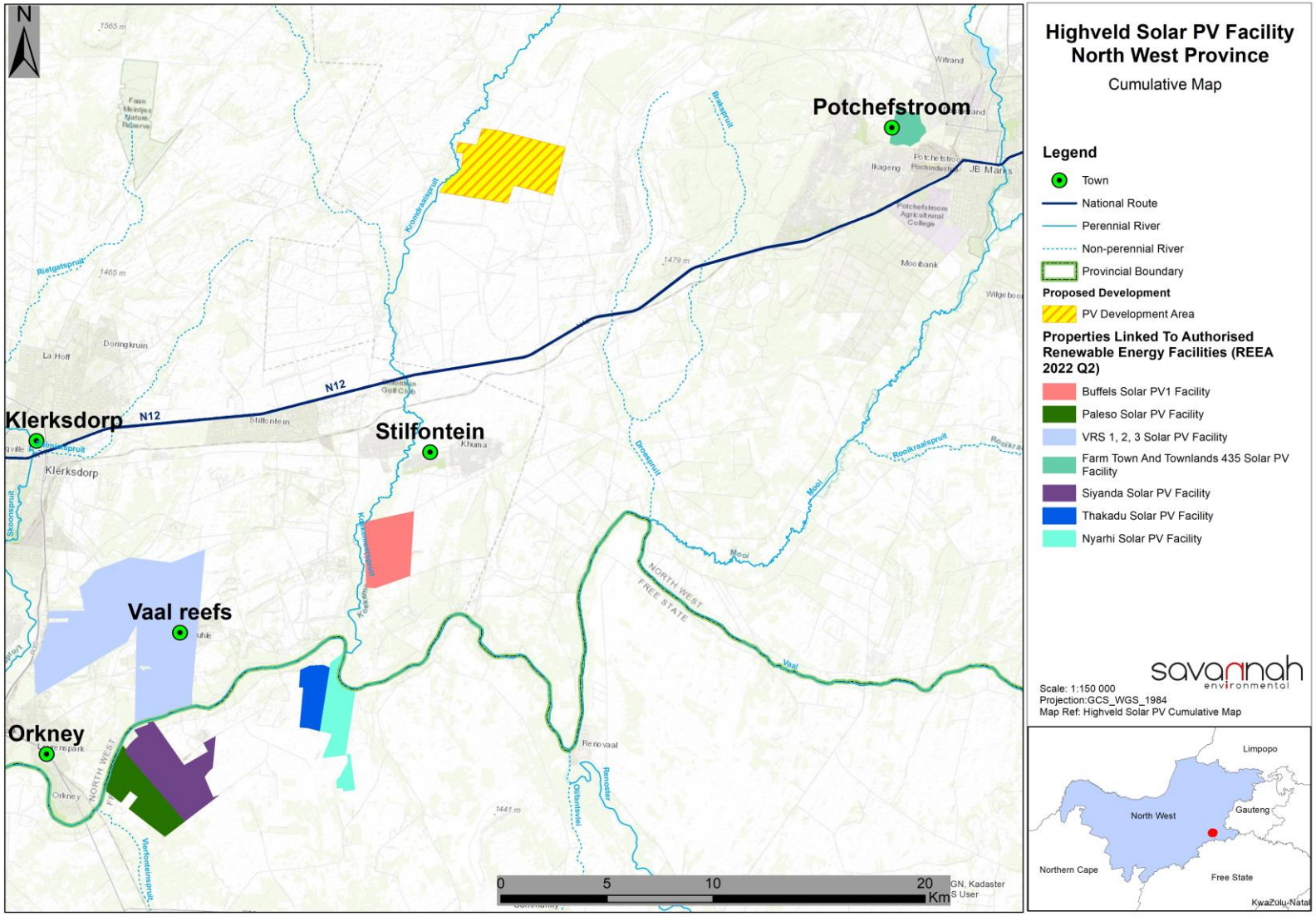

Figure 16 Map of other renewable energy projects within a 50km radius around the proposed Highveld Solar PV Facility

Table 3 Assessment of cumulative impact of decrease in areas available for livestock farming

Nature: Decrease in areas with suitable land capability for cattle farming.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short duration - 2-5 years (2)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly likely (4)	Highly likely (4)
Significance	**Low (28)**	Medium (40)
Status (positive/negative)	Negative	Negative
Reversibility	High	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: The only mitigation measure for this impact is to keep the footprints of all renewable energy facilities as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.		

Table 4 Assessment of cumulative impact of areas susceptible to soil erosion

Nature: Increase in areas susceptible to soil erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (33)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil erosion prevention and management, as defined in Sections 10.2.1 and 10.2.2. above.		

Table 5 Assessment of cumulative impact of areas susceptible to soil compaction

Nature: Increase in areas susceptible to soil erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (27)**
Status (positive/negative)	Negative	Negative

Reversibility	Low	Low
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil compaction prevention and management, as defined in Sections 10.2.1 and 10.2.2 above.		

Table 6 Assessment of cumulative impact of increased risk of soil pollution

Nature: Increase in areas susceptible to soil pollution		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil pollution prevention and management, as defined in Sections 10.2.1 and 10.2.2. above.		

11 Mitigation and management measures

The objective of the mitigation and management measures presented below is to reduce the risk of soil degradation that will in turn affect the ability of soils within the project site to support the natural vegetation and provide ecosystem services.

<u>Prevention and management of soil erosion:</u>

Project component/s	• Construction of infrastructure • Construction of the access road
Potential Impact	Soil particles can be removed from the area through wind and water erosion
Activity/risk source	The removal of vegetation in areas where infrastructure will be constructed.
Mitigation: Target/Objective	To avoid the onset of soil erosion that can spread into other areas

Mitigation: Action/control	**Responsibility**	**Timeframe**
• Limit vegetation clearance to only the areas where the surface infrastructure will be constructed.	Environmental Officer / SHEQ division	During the entire construction, operational and decommissioning phases

• Avoid parking of vehicles and equipment outside of designated parking areas. • Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring). • Design and implement a Stormwater Management System where run-off from surfaced areas is expected. • Re-establish vegetation along the access road to reduce the impact of run-off from the road surface.		

Performance Indicator	No visible signs of soil erosion around the project infrastructure
Monitoring	• Regular inspections around the constructed infrastructure to detect early signs of soil erosion developing. • When signs of erosion are detected the areas must be rehabilitated, using a combination of geo-textiles and re-vegetation to prevent the eroded area(s) from expanding.

Prevention and management of soil pollution:

Project component/s	• Construction of infrastructure • Daily activities and maintenance during the operational phase
Potential Impact	Potential fuel and oil spills from vehicles and waste generation can cause soil pollution.
Activity/risk source	• Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation. • Spills from vehicles transporting workers, equipment, and construction material to and from the construction site. • The accidental spills from temporary chemical toilets used by construction workers. • The generation of domestic waste by construction workers. • Spills from fuel storage tanks during construction. • Pollution from concrete mixing. • Pollution from road-building materials. • Any construction material remaining within the construction area once construction is completed. • Containment breaches related to the battery units and any inadvertent chemical exposure therefrom.
Mitigation: Target/Objective	To avoid soil pollution that can harm the surrounding environment and human health.

Mitigation: Action/control	**Responsibility**	**Timeframe**
• Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills.	Environmental Officer / SHEQ division	During the entire construction, operational and decommissioning phases

• Any waste generated during construction must be stored in designated containers and removed from the site by the construction teams. • Any left-over construction materials must be removed from site. • Ensure battery transport and installation by accredited staff / contractors. • Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.		

Performance Indicator	• No visible signs of waste and spills within the project site. • No accumulation of contaminants in the soils of the project site.
Monitoring	• Regular inspections of vehicles and equipment that enter the project site. • Analysis of soil samples around high-risk areas to determine whether soil contaminants are present. • In the case that soil pollution is detected, immediate remediation must be done.

12 Acceptability statement

Following the data analysis and impact assessment above, the proposed Highveld Solar PV Facility is considered an acceptable development within the area that was assessed for the purpose of compiling the Agricultural Assessment Report.

The soil forms present within the development area are shallow and underlain by lithic material, solid rock and fractured rock that has severe limitations to rainfed crop production. The effective soil depths of soil within the proposed development footprint ranges between 0.05m and 0.45m. The current agricultural land use is livestock farming, and the land has never been used for rainfed or irrigated crop production. There is also no irrigation infrastructure, such as centre pivots or drip irrigation, present within the project area. The grazing capacity (according to DALRRD, 2018), is 6ha/LSU, indicating that the proposed development footprint area of 433ha has forage to feed 72 head of cattle. The development footprint area consists of two land capability classes i.e. Very low (Class 03) over the largest part of the area (where the Mispah soils are present) as well as Low (Class 05) land capability where the Glenrosa and Vaalbos soils are present.

It is anticipated that the construction and operation of the Highveld Solar PV Facility will have impacts that range from medium to low. Through the consistent implementation of the recommended mitigation measures, most of the impacts can be reduced to low significance. It is my professional opinion that this application be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed project development footprint that will be fenced off.

13 Reference list

Crop Estimates Consortium, 2019. *Field crop boundary data layer (NW province)*, 2019. Pretoria. Department of Agriculture, Land Reform and Rural Development.

Department of Agriculture, Land Reform and Rural Development, 2019. *High potential agricultural areas 2019 – Spatial data layer*, *North West Province*, 2021. Pretoria.

Department of Agriculture, Land Reform and Rural Development, 2018. *Long-term grazing capacity for South Africa*: Data layer. Government Gazette Vol. 638, No. 41870. 31 August 2018. Regulation 10 of the Conservation of Agricultural Resources Act (CARA): Act 43 of 1983. Pretoria. Government Printing Works.

Department of Agriculture, Land Reform and Rural Development, 2016. *National land capability evaluation raster data: Land capability data layer*, 2016. Pretoria.

Land Type Survey Staff, 1972 – 2006. *Land Types of South Africa data set*. ARC – Institute for Soil, Climate and Water. Pretoria.

The Soil Classification Working Group, 2018. *Soil Classification – Taxonomic System for South Africa.* Dept. of Agric., Pretoria.

APPENDIX 1 – DECLARATION OF INDEPENDENCE AND SPECIALIST DETAILS

1. SPECIALIST INFORMATION

Specialist Company Name:	TerraAfrica Consult CC			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Mariné Pienaar			
Specialist Qualifications:	MSc. Environmental Science (Wits) ; BSc. (Agric) Plant Production (UP)			
Professional affiliation/registration:	SACNASP Registration No:400274/10 Soil Science Society of South Africa ; IAIAsa			
Physical address:	Farm Strydpoort 403, Ottosdal, 2610			
Postal address:	P.O. Box 433, Ottosdal			
Postal code:	2610	Cell:	082 828 3587	
Telephone:	082 828 3587	Fax:	N/A	
E-mail:	mpienaar@terraafrica.co.za			

2. DECLARATION BY THE SPECIALIST

I, Mariné Pienaar, 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 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

TerraAfrica Consult

Name of Company:

2022-10-25

Date

Details of Specialist, Declaration and Undertaking Under Oath

APPENDIX 2 - CURRICULUM VITAE OF SPECIALIST

+2782-828-3587

mpienaar@terraafrica.co.za

linkedin.com/in/marinepienaar

Wolmaransstad,
South Africa

EXPERTISE

Soil Quality Assessment

Soil Policy and Guidelines

Agricultural Agro-Ecosystem Assessment

Sustainable Agriculture

Data Consolidation

Land Use Planning

Soil Pollution

Hydropedology

EDUCATION

MASTER'S DEGREE
Environmental Science
University of Witwatersrand
2010 – 2018

BACHELOR'S DEGREE
Agricultural Science
University of Pretoria
2001 – 2004

PROFESSIONAL PROFILE

I contribute specialist knowledge on agriculture and soil management to ensure long-term sustainability of projects in Africa. For the past thirteen years, it has been my calling and I have consulted on more than 200 projects. My clients include environmental and engineering companies, mining houses, and project developers. I enjoy the multi-disciplinary nature of the projects that I work on and I am fascinated by the evolving nature of my field of practice. The next section provide examples of the range of projects completed. A comprehensive project list is available on request.

PROJECT EXPERIENCE

Global Assessment on Soil Pollution

Food and Agricultural Organisation (FAO) of the United Nations (UN)

Author of the regional assessment of Soil in Sub-Saharan Africa. The report is due for release in February 2021. The different sections included:

- Analysis of soil and soil-related policies and guidelines for each of the 48 regional countries
- Description of the major sources of soil pollution in the region
- The extent of soil pollution in the region and as well as the nature and extent of soil monitoring
- Case study discussions of the impacts of soil pollution on human and environmental health in the region
- Recommendations and guidelines for policy development and capacitation to address soil pollution in Sub-Saharan Africa

Data Consolidation and Amendment

Range of projects: Mining Projects, Renewal Energy

These projects included developments where previous agricultural and soil studies are available that are not aligned with the current legal and international best practice requirements such as the IFC Principles. Other projects are expansion projects or changes in the project infrastructure layout. Tasks on such projects include the incorporation of all relevant data, site verification, updated baseline reporting and alignment of management and monitoring measures.

Project examples:

- Northam Platinum's Booysendal Mine, South Africa
- Musonoi Mine, Kolwezi District, Democratic Republic of Congo
- Polihali Reservoir and Associated Infrastructure, Lesotho
- Kaiha 2 Hydropower Project, Liberia
- Aquarius Platinum's Kroondal and Marikana Mines

PROFESSIONAL MEMBERSHIP

South African Council for Natural Scientific Professions (SACNASP)

Soil Science Society of South Africa (SSSSA)

Soil Science Society of America (SSSA)

Network for Industrially Contaminated Land in Africa (NICOLA)

LANGUAGES

English (Fluent)

Afrikaans (Native)

French (Basic)

PRESENTATIONS

There is spinach in my fish pond
TEDx Talk
Available on YouTube

♦

Soil and the Extractive Industries
Session organiser and presenter
Global Soil Week, Berlin (2015)

♦

How to dismantle an atomic bomb
Conference presentation (2014)
Environmental Law Association (SA)

PROJECT EXPERIENCE (Continued)

Agricultural Agro-Ecosystem Assessments

Range of projects: Renewable Energy, Industrial and Residential Developments, Mining, Linear Developments (railways and power lines)

The assessments were conducted as part of the Environmental and Social Impact Assessment processes. The assessment process includes the assessment of soil physical and chemical properties as well as other natural resources that contributes to the land capability of the area.

Project examples:

- Mocuba Solar PV Development, Mozambique
- Italthai Railway between Tete and Quelimane, Mozambique
- Lichtenburg PV Solar Developments, South Africa
- Manica Gold Mine Project, Mozambique
- Khunab Solar PV Developments near Upington, South Africa
- Bomi Hills and Mano River Mines, Liberia
- King City near Sekondi-Takoradi and Appolonia City near Accra, Ghana
- Limpopo-Lipadi Game Reserve, Botswana
- Namoya Gold Mine, Democratic Republic of Congo

Sustainable Agriculture

Range of projects: Policy Development for Financial Institutions, Mine Closure Planning, Agricultural Project and Business Development Planning

Each of the projects completed had a unique scope of works and the methodology was designed to answer the questions. While global indicators of sustainable agriculture are considered, the unique challenges to viable food production in Africa, especially climate change and a lack of infrastructure, in these analyses.

Project examples:

- Measurement of sustainability of agricultural practices of South African farmers – survey design and pilot testing for the LandBank of South Africa
- Analysis of the viability of avocado and mango large-scale farming developments in Angola for McKinsey & Company
- Closure options analysis for the Tshipi Borwa Mine to increase agricultural productivity in the area, consultation to SLR Consulting
- Analysis of risks and opportunities for farm feeds and supplement suppliers of the Southern African livestock and dairy farming industries
- Sustainable agricultural options development for mine closure planning of the Camutue Diamond Mine, Angola

PROFESSIONAL DEVELOPMENT

Contaminated Land Management 101 Training
Network for Industrially Contaminated Land in Africa
2020

Intensive Agriculture in Arid & Semi-Arid Environments
CINADCO/MASHAV R&D Course, Israel
2015

World Soils and their Assessment Course
ISRIC – World Soil Information Centre, Netherlands
2015

Wetland Rehabilitation Course
University of Pretoria
2010

Course in Advanced Modelling of Water Flow and Solute Transport in the Vadose Zone with Hydrus
University of Kwazulu-Natal
2010

Environmental Law for Environmental Managers
North-West University Centre for Environmental Management
2009

PROJECT EXPERIENCE (Continued)

Soil Quality Assessments

Range of projects: Rehabilitated Land Audits, Mine Closure Applications, Mineral and Ore Processing Facilities, Human Resettlement Plans

The soil quality assessments included physical and chemical analysis of soil quality parameters to determine the success of land rehabilitation towards productive landscapes. The assessments are also used to understand the suitability for areas for Human Resettlement Plans

Project examples:

- Closure Planning for Yoctolux Colliery
- Soil and vegetation monitoring at Kingston Vale Waste Facility
- Exxaro Belfast Resettlement Action Plan Soil Assessment
- Soil Quality Monitoring of Wastewater Irrigated Areas around Matimba Power Station
- Keaton Vanggatfontein Colliery Bi-Annual Soil Quality Monitoring

REFERENCES

NATALIA RODRIGUEZ EUGENIO
Soil Pollution Specialist
FAO of the UN
+3906-5705-0134
Natalia.rodriguezeugenio@fao.org

VERNON SIEMELINK
Director
Eco Elementum
+2772-196-9928
vernon@ecoe.co.za

JO-ANNE THOMAS
Director
Savannah Environmental
+2711-656-3237
joanne@savannahsa.com

RENEE JANSE VAN RENSBURG
Environmental Manager
CIGroup
+2782-496-9038
reneejvr@cigroup.za.com

APPENDIX 3 – PROOF OF SACNASP REGISTRATION OF SPECIALIST

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Mariné Pienaar

Registration Number: 400274/10

is a registered scientist

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

Soil Science (Professional Natural Scientist)
Agricultural Science (Professional Natural Scientist)

Effective **20 October 2010** Expires **31 March 2023**

Chairperson

Chief Executive Officer

To verify this certificate scan this code