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Agricultural Compliance Statement for the Proposed Naledi PV

Submitted by TerraAfrica Consult cc
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April 2020

Declaration of the 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
April 2020

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1. Introduction

TerraAfrica Consult cc was appointed to conduct the agricultural compliance assessment as part of the Basic Assessment (BAR) process for the proposed Naledi PV. A development area (located within the study area) with an extent of around 330ha has been identified by Naledi PV (Pty) Ltd as a technically suitable site for the development of a solar PV facility with a contracted capacity of up to 100MW. Two alternative access roads to the development area are also comparatively assessed as part of this report.

The affected area where the proposed development will be is located on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452. These land portions are approximately 20km south-west of Upington within the Kai !Garib Local Municipality and the ZF Mgcawu District Municipality in the Northern Cape Province (**Figure 1**). The site is on the border of the Dawid Kruiper Local Municipality to the east. The broader study area and the development area are located within Focus Area 7 of the Renewable Energy Development Zones (REDZ), which is known as the Upington REDZ.

2. Environmental legislation and soil management guidelines applicable to study

Since Naledi PV will be a solar PV energy generation facility with an electricity output with more than 20 megawatts, the report follows the protocols as stipulated for agricultural assessment in Government Notice 320 of 2020 (GN320). 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) (from here onwards referred to as NEMA). It replaces the previous requirements of Appendix 6 of the Environmental Impact Assessment Regulations of NEMA.

In addition to the specific requirements 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:

- The Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. This Act 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.
- Section 3 of the Subdivision of Agricultural Land Act 70 of 1970 may also relevant to the development.
- In addition to this, the National Water Act (Act 36 of 1998) deals with the protection of water resources (i.e. wetlands and rivers). An Aquatic Impact Assessment was completed for the proposed Naledi PV by Dr. Brian Colloty of Enviro Sci (Pty) Ltd.

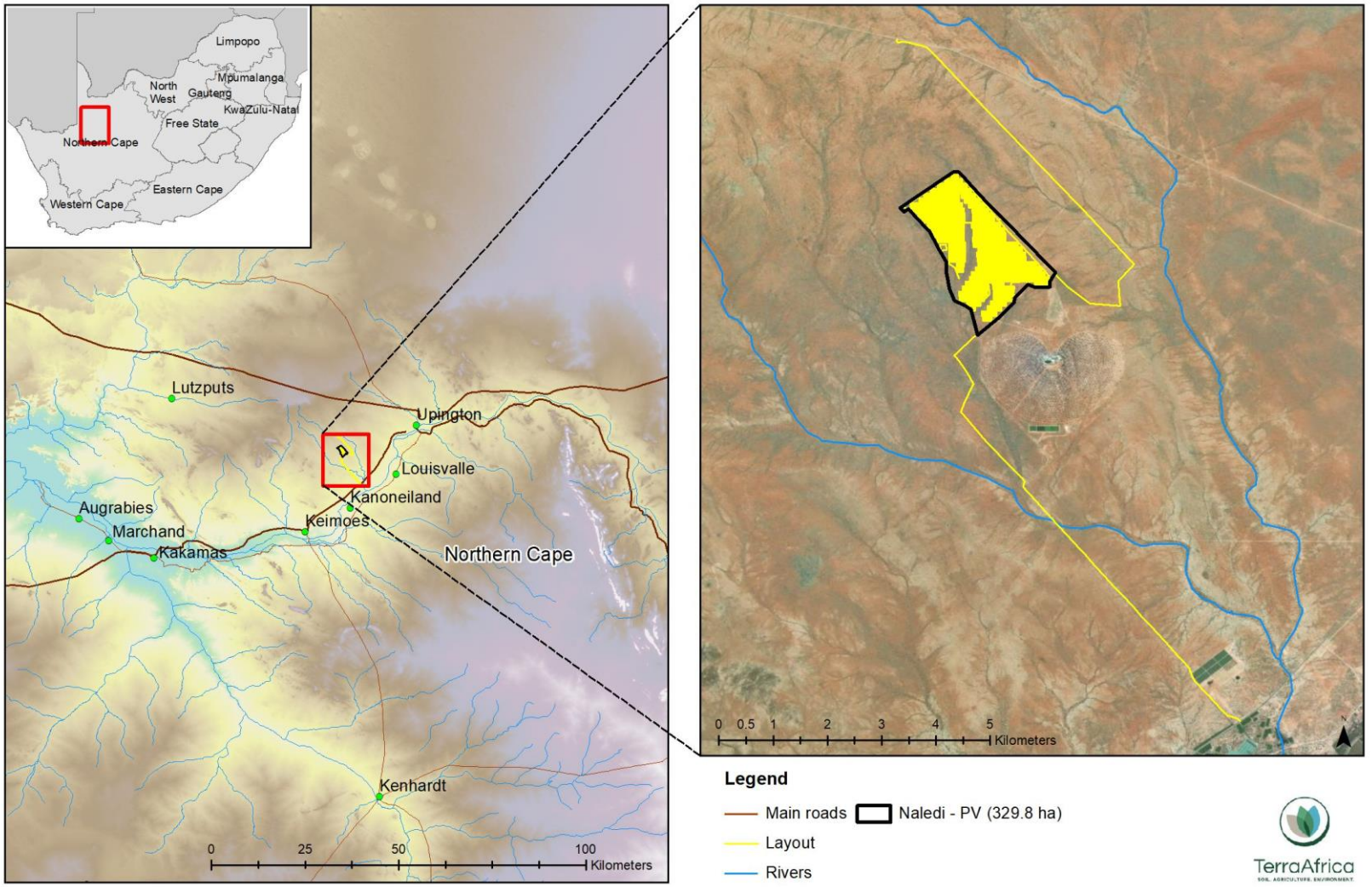

Figure 1: Locality map of the Naledi PV development area and access road alternatives

3. Purpose and objectives of the compliance statement

The overarching purpose of the Agricultural Compliance Statement that will be included in the Basic Assessment Report, is to ensure that the sensitivity of the site to the proposed change in land use from agriculture to the generation of renewable energy, is sufficiently considered. Also, that the information provided in this report, enables the Competent Authority to come to a sound conclusion on the impact of the proposed project on the food production potential of the study area and development area.

To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives:

- 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 of the current land use and environmental sensitivity pertaining to the study field.
- All data and conclusions are submitted together with the Basic Assessment Report for the proposed Naledi PV project.

According to GN320, 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.
- It has to confirm that the site is of “low” or “medium” sensitivity for agriculture.
- It has to indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.

4. Terms of Reference

In addition to the requirements stipulated in GN320, the following Terms of Reference as stipulated by Savannah Environmental (Pty) Ltd applies to the Agricultural Compliance Statement:

- To ensure a thorough assessment, consider all the baseline data that was gathered for projects in close proximity to the proposed Naledi PV project.
- Identify and assess potential impacts on both agricultural potential as well as soil, resulting from the proposed Naledi PV project.
- Identify and describe potential cumulative soil, agricultural potential and land capability impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area.
- Recommend mitigation, management and monitoring measures to minimise impacts and/or optimise benefits associated with the proposed project.

5. Methodology

The different steps that were followed to gather the information used for the compilation of this report, is outlined below.

5.1 Desktop analysis of satellite imagery

The most recent aerial photography of the area available from Google Earth was obtained. The satellite imagery was analysed to determine areas of existing impact and land uses within the study area as well as the larger landscape. It was also scanned for any areas where crop production and farming infrastructure may be present.

5.2 Previous assessment of the area

The land parcels on which the proposed project will be located (Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452) was visited on 4 and 5 July 2019 for a site inspection that included a soil classification survey. Although the focus of the soil classification survey was the areas considered for other projects (Klip Punt PV1, McTaggarts PV1, McTaggarts PV2, McTaggarts PV3 and the Khunab Solar Grid Connection), the development area proposed for the Naledi PV project was traversed by vehicle and soil profile data and other site characteristics were recorded.

5.3 Analysis of all other relevant available information

To ensure a comprehensive analysis the proposed development area, the following data was also analysed:

- The newly released National Land Capability Evaluation Raster Data Layer was obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) to determine the land capability classes of the development area according to this system. The new data was developed by DAFF to address the shortcomings of the 2002 national land capability data set. The new data was developed using a spatial evaluation modelling approach (DAFF, 2017).
- The long-term grazing capacity for South Africa 2018 was also analysed for the area within which the Naledi PV development area falls. 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 Northern Cape Field Boundaries (November 2019) was analysed to determine whether the proposed Naledi PV project infrastructure 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, smallholdings and subsistence farming. This data was also used to allocate a sensitivity rating for the proposed development area as well as a 50m buffer area around it.
- Land type data for the study area and 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 (in the cross section).

5.4 Impact assessment methodology

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

- The **nature**, which shall include 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*, which shall describe 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**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be 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.
- 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),
- 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

6 Assumptions, uncertainties and gaps

- Although the proposed development area was visited in July 2019 for the detailed assessment of the project and developments areas of other PV projects i.e. Klip Punt PV1, McTaggarts PV1, McTaggarts PV2, McTaggarts PV3 and the Khunab Solar Grid Connection, the entire area of the proposed Naledi PV project was traversed and the observations made regarding soil and land use is considered sufficient for the purpose of this report.
- This assumption is further supported by the report author's experience in soil classification of other nearby areas such as that of the Sirius Solar PV Project Three and Sirius Solar PV Project Four projects.
- It was also assumed that the desktop data has high correlation with the actual conditions within the study area and development area, as was found for similar projects in close proximity to the proposed Naledi PV development area.
- No flood line delineations were available for the study area and development area during the time of this assessment. Should it become available at a later stage, it can be included in the results of the data analysis.
- No other uncertainties and gaps have been identified that may affect the conclusions made in this report.

7 Response to concerns raised by I&Aps

Thus far, no concerns were raised by I & APs during the Public Participation Process pertaining to the continuation of existing land uses in the surrounding area. Should any comment be received, it will be addressed in this report.

8 Results of data analysis

8.1 Land capability

The proposed Naledi PV 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 in the landscape. The area where the solar panels will be constructed is a mixture of Class 03 (Low-Very low), Class 04 (Low-Very low) and Class 05 (Low) land capabilities. Main Access Road 1 (Alternative 1) traverses through an area dominated by Class 05 (Low) land capability interspersed with smaller areas of Class 04 (Low-Very low) land capability. Main Access Road 2 (Alternative 2) traverses through and area that consists of a mixture of Class 03, Class 04 and Class 05 land capabilities.

8.2 Field crop boundaries

The position of field crops around the proposed Naledi PV development area is illustrated in

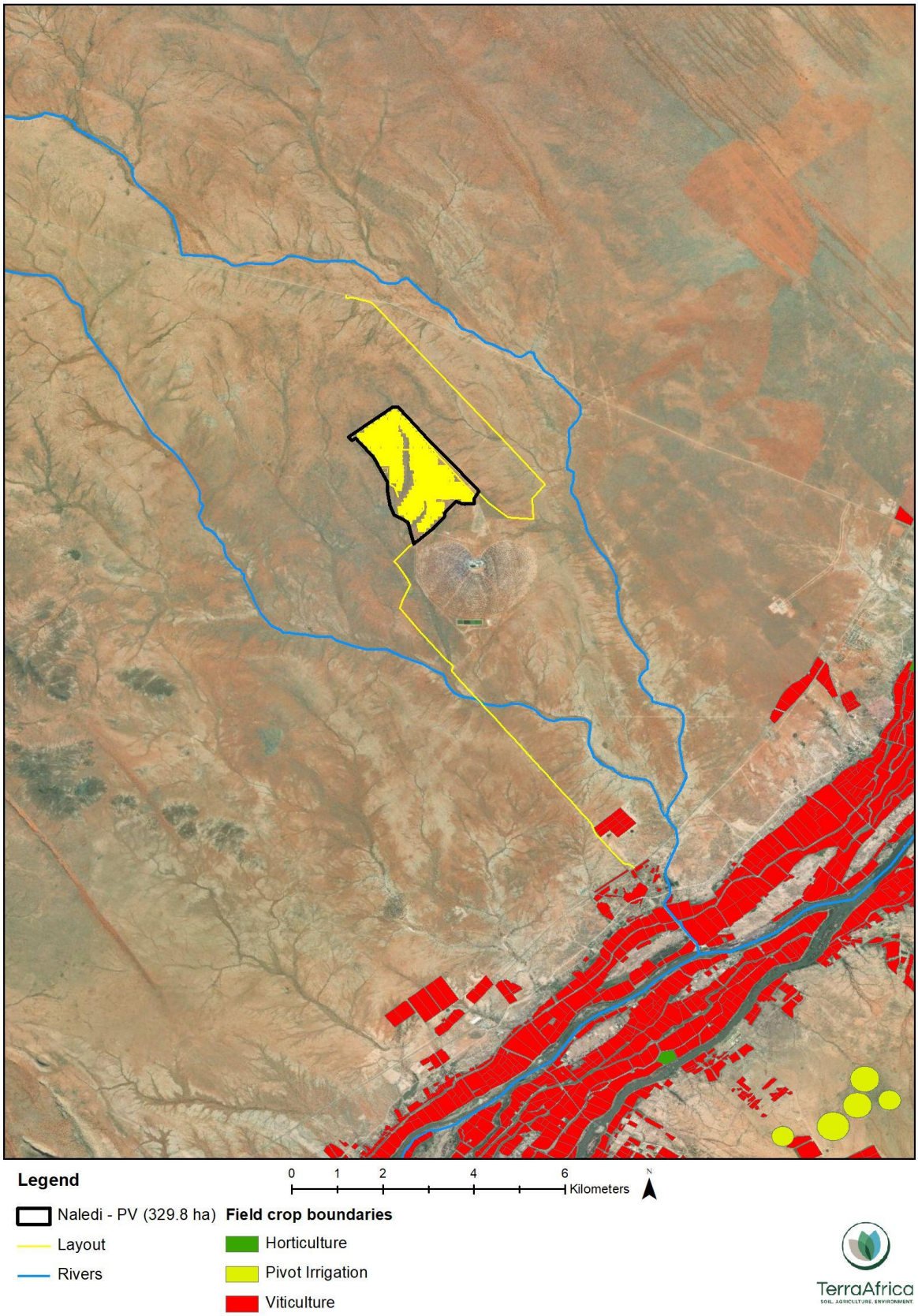

Figure 3. There are no field crops within the development area, along the access road alternatives as well as within a 50m buffer area around the proposed development footprint. A block of viticulture is present directly next to the Main Access Road 1, towards the south-eastern end of the proposed access road alternative. The block of wine grapes was observed during the site assessment conducted on 4 and 5 July 2019. It is fenced-off from the main road and the vines are covered by shade-net structures.

Several blocks of viticulture as well as a few centre pivot irrigation areas and a small block of horticultural production is located south-west of the Naledi PV development area, in very close proximity to the Orange River from which the irrigation water for these crops are abstracted.

8.3 Grazing capacity

The ideal grazing capacity of a specified area is an indication of the long-term production potential of the vegetation layer growing there 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).

This unit used for large animals such as cattle can be converted to small animal units or small stock units. The conversion factor is 4 small stock units that equates one large stock unit. Small stock units are more applicable in areas where sheep and goat farming is a more sustainably type of livestock farming.

Following the metadata layer obtained from DAFF, the grazing capacity of the larger area within which the Naledi PV development area falls, has grazing capacity that ranges between 28 and 32 ha/LSU. When converting this figure to Small Stock Units (SSU), the area has grazing capacity of 7 and 8 ha/SSU.

Both the main access road alternatives are excluded from the potential of the site for livestock farming. The reason for this is that both the roads are already in use; therefore no vegetation is growing here. The area considered for a loss of grazing veld, is the 330ha development area where the solar panels and supporting infrastructure will be constructed. Following the grazing capacities as depicted in
Figure 4, the Naledi PV area is suitable for the grazing of 10 to 12 head of cattle or 41 to 47 head of sheep or goats.

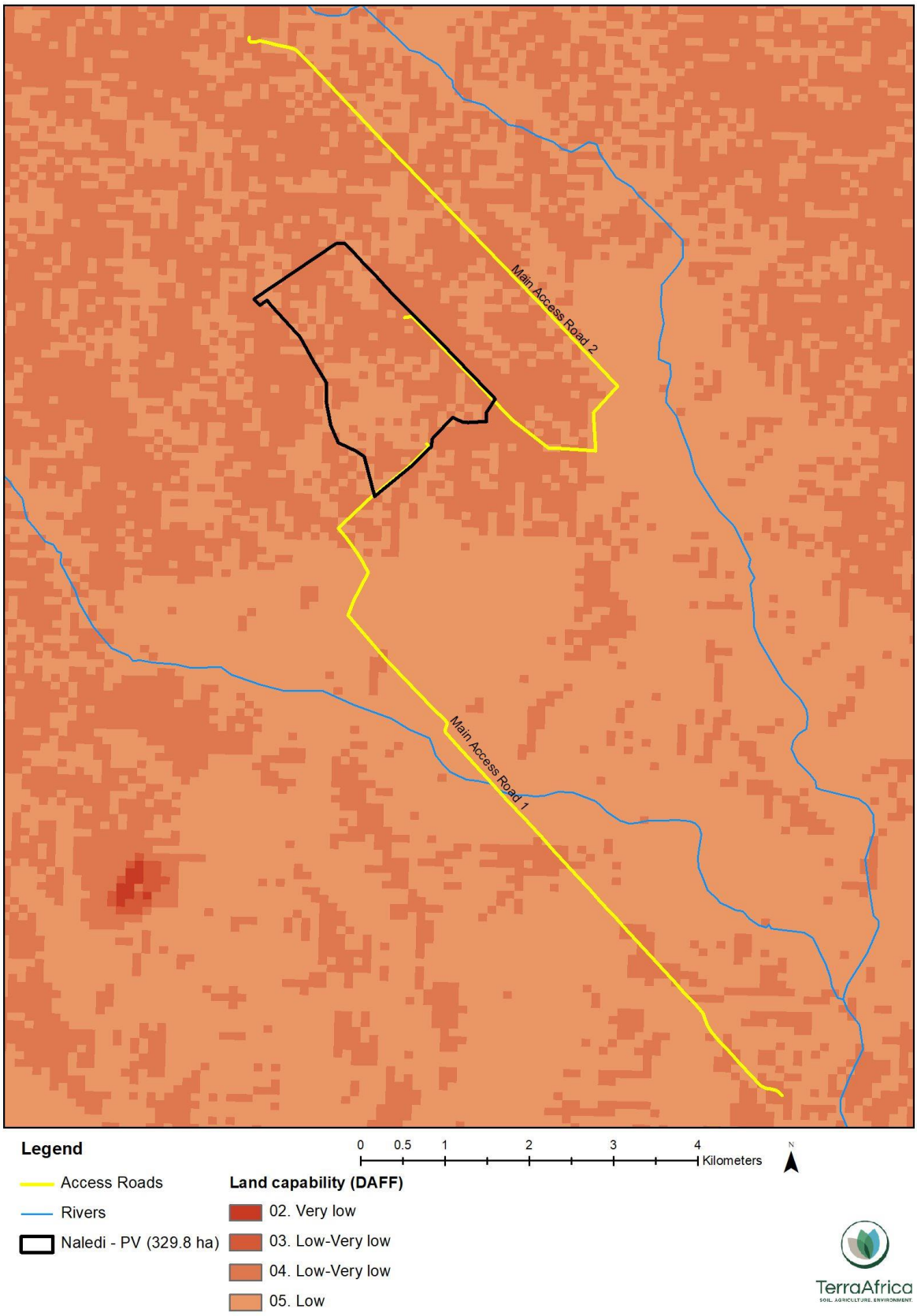

Figure 2 Land capability classification of the Naledi PV development area and surrounding area

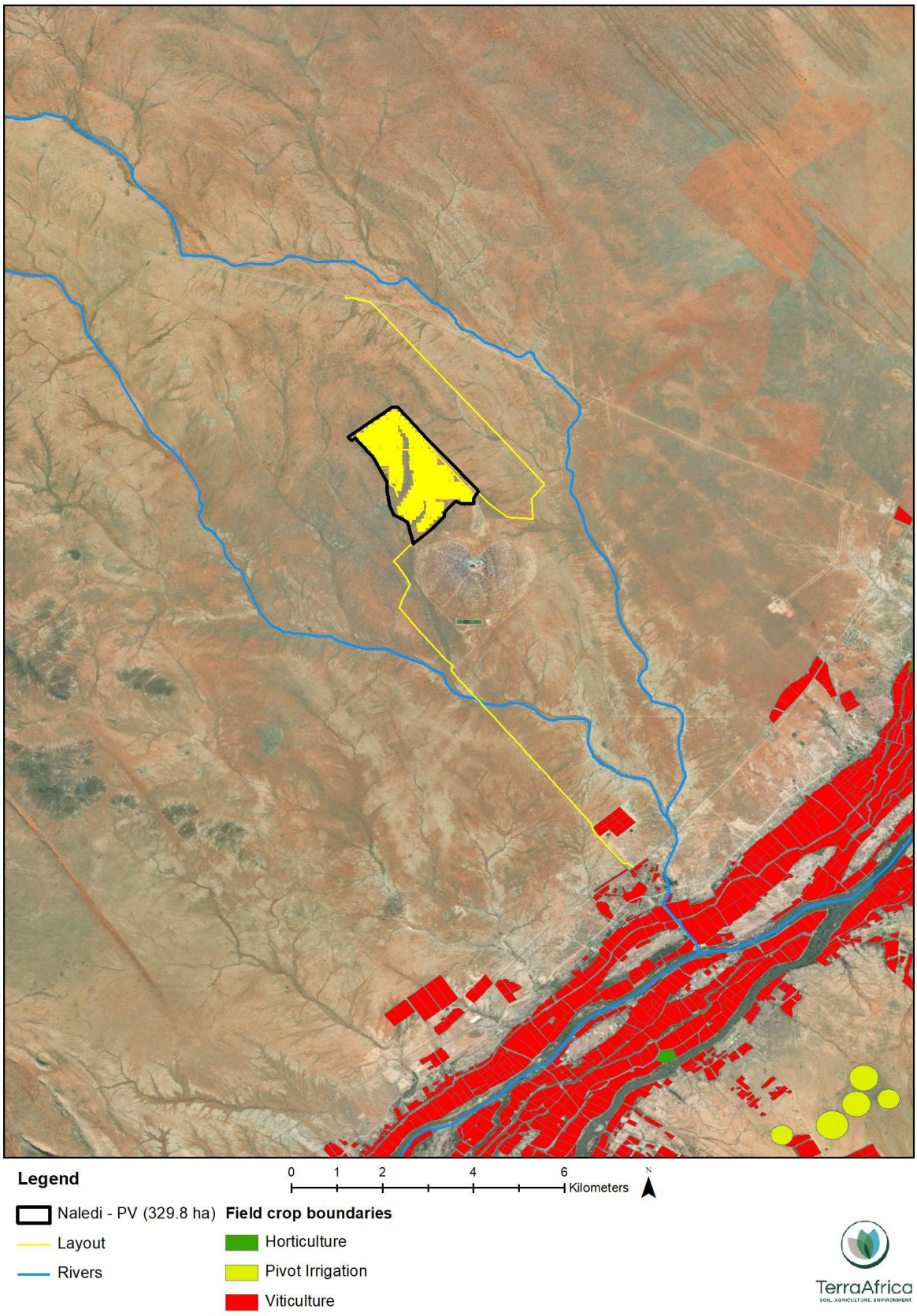

Figure 3 Location of field crop boundaries in the larger area around the Naledi PV development area (data source: DAFF, 2019)

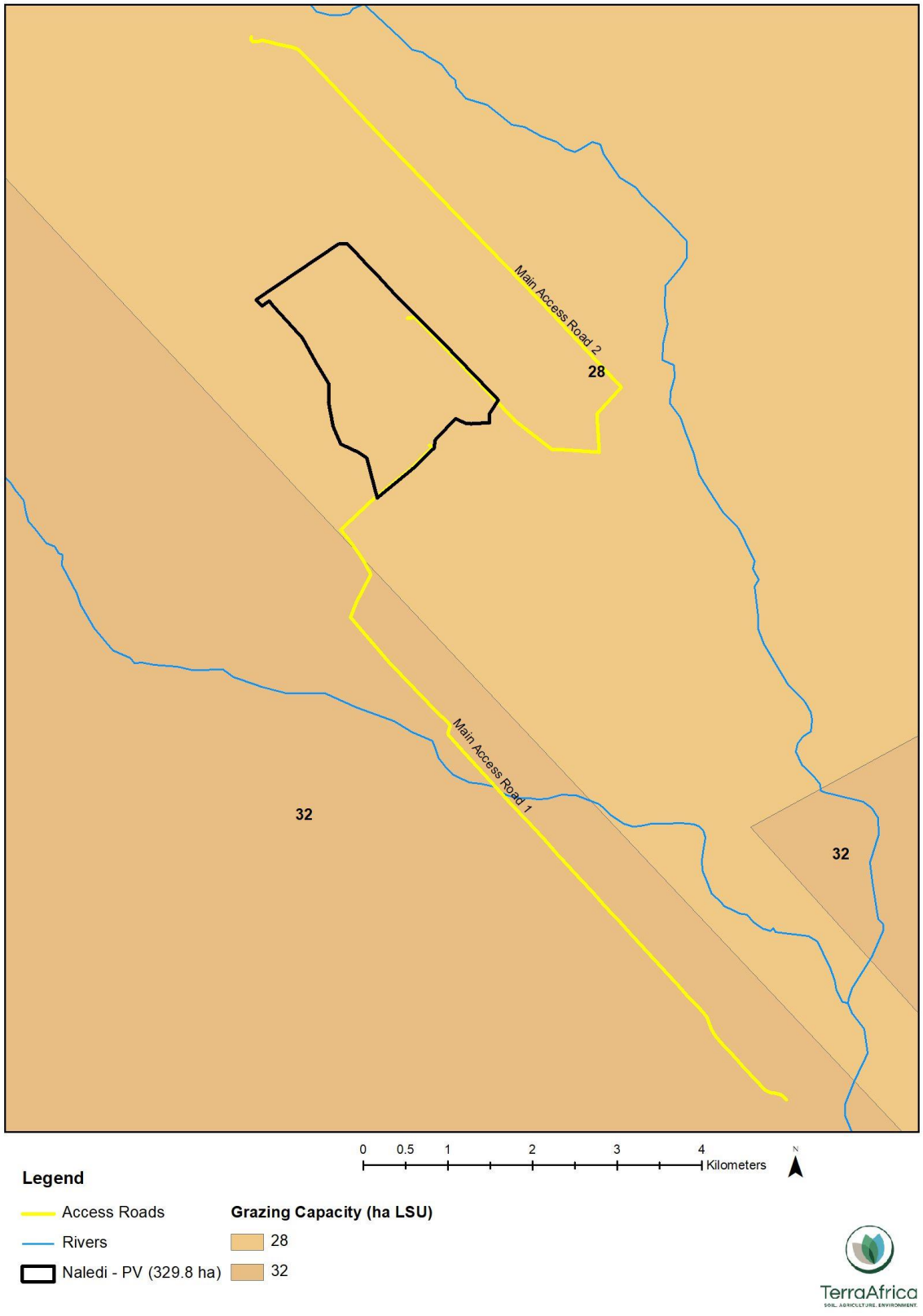

Figure 4 Grazing capacity of the Naledi PV development area and that of the surrounding area

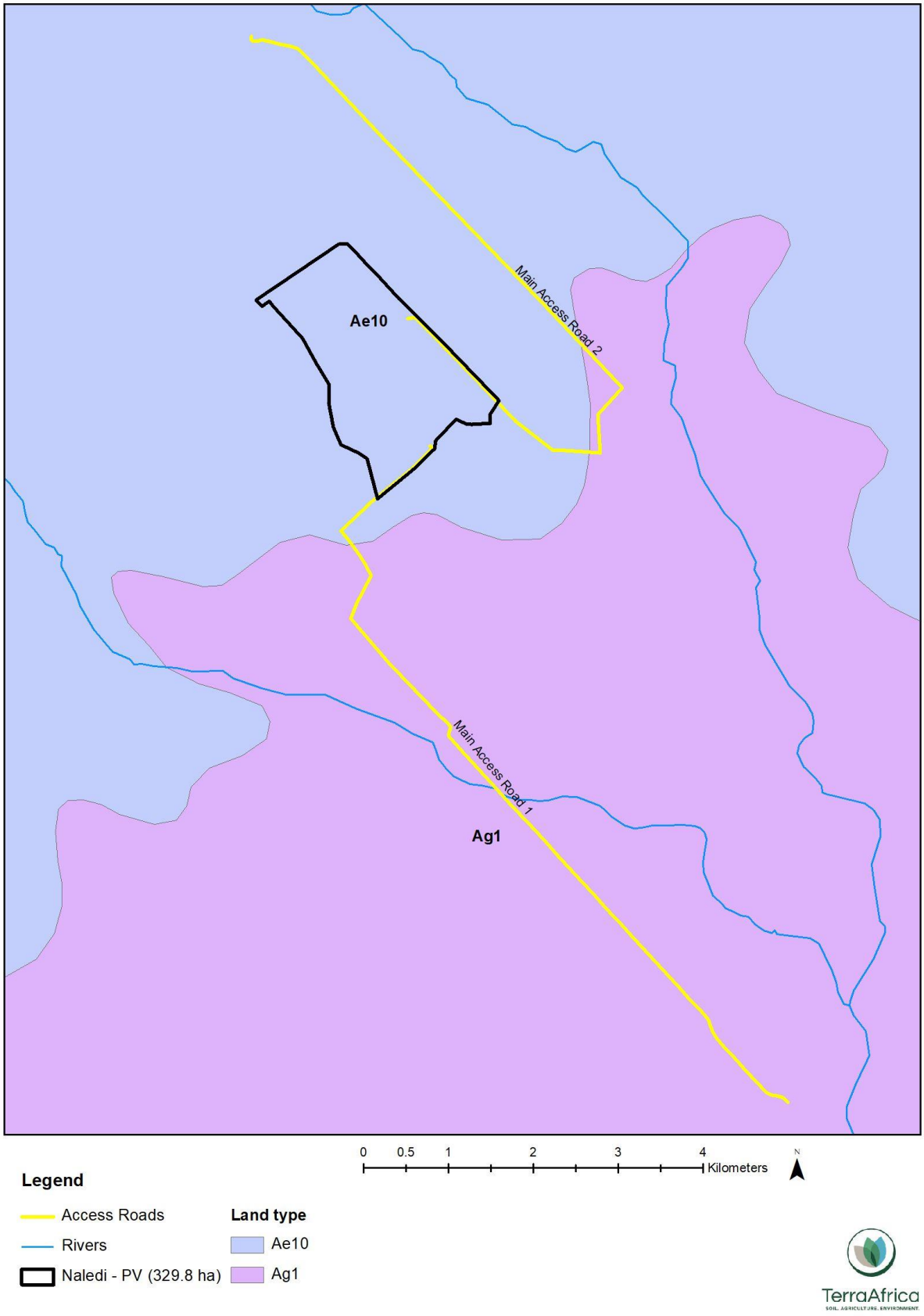

Figure 5 Land type classification of the Naledi PV development area as well as the surrounding area

8.4 Land types

The entire development area consists of two land types i.e. Land Type Ae10 and Land Type Ag1 (**Error! Reference source not found.**). The entire development area as well as the largest section of Main Access Road Alternative 2 is dominated by Land Type Ae10 while the largest part of Main Access Road Alternative 1, consists of Land Type Ag1. Each of the land types are described below.

Land Type Ae10

According to the land type data sheet, Land Type Ae10 is underlain by migmatite, gneiss and ultra-metamorphic rocks of the Namaqualand Metamorphic Complex. Following Figure 6, this land type also has four different terrain positions with the flat plains of Position 4 dominating the landscape and Position 5 indicating small depressions where water can accumulate in the landscape after rainfall events. Position 4 consists of an equal mixture of shallow Mispah soil as well as shallow red apedal soil profiles underlain by limestone (either soft or hardpan carbonate horizons). Position 5 is dominated by the Mispah form interspersed with approximately 10% of Hutton soil profiles. Positions 1 and 3 (hilltop and mid-slope respectively) area dominated by rock interspersed with shallow Mispah profiles.

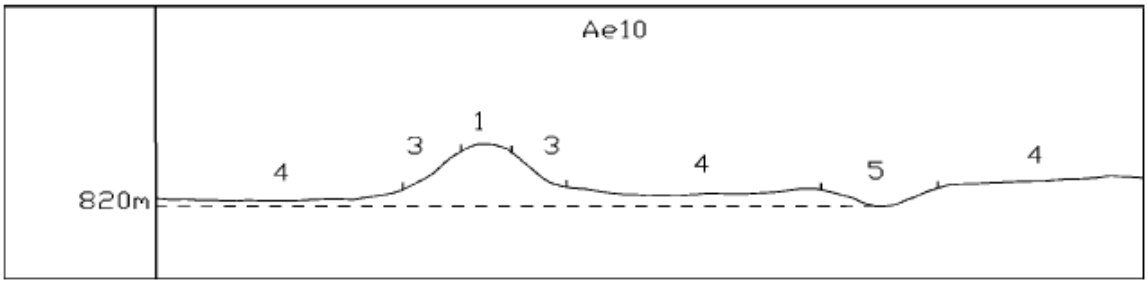

Figure 6: Terrain form sketch of Land Type Ae10

Land Type Ag1

Following **Figure 7**, Land Type Ag 1 has four different terrain positions and indicates an undulating landscape. The land type is dominated by very shallow soil profiles and includes soil of the Mispah form as well as forms where shallow red apedal or yellow-brown apedal soil is underlain either by rock or a carbonate horizon. Soil depths in this land type range between 10 and 45cm with only Terrain Position 4 having a possibility for deep Hutton soil profiles that range between 60 and 150cm in depth. The underlying geology of Land Type Ag1 is described as granite, migmatite and gneiss of the Namaqualand Metamorphic Complex.

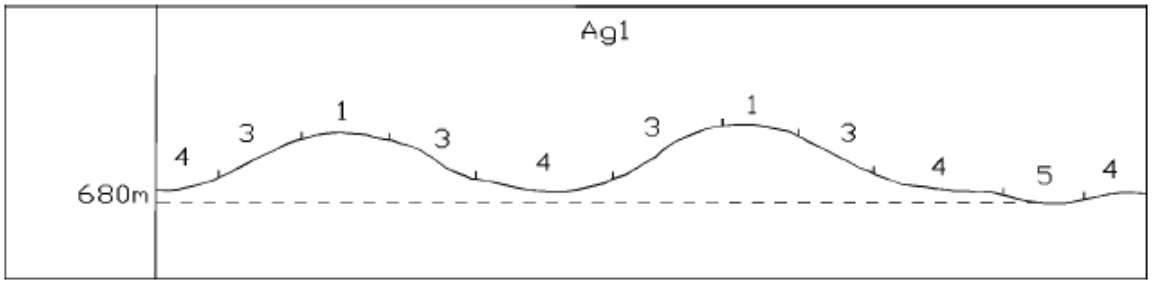

Figure 7: Terrain form sketch of Land Type Ag1

9 Results of on-site inspection

9.1 Soil forms

Six different soil forms were identified within the Naledi PV development area during the on-site inspection. The soil profiles include that of the Mispah, Glenrosa, Brandvlei, Coega, Hutton and Plooysburg forms. The profiles are generally all shallow, with a few deeper profiles present in lower landscape positions where sand particles have accumulated over time with water movement during rainfall events. The main difference between the different soil profiles present is the nature of the depth-restricting underlying material. For the Brandvlei, Coega and Plooysburg profiles, the sandy surface material is underlain by either a hardpan or soft carbonate horizon. For the Mispah, Glenrosa and Hutton profiles, the soil depth is restricted by either broken hard rock, solid hard rock or lithic material.

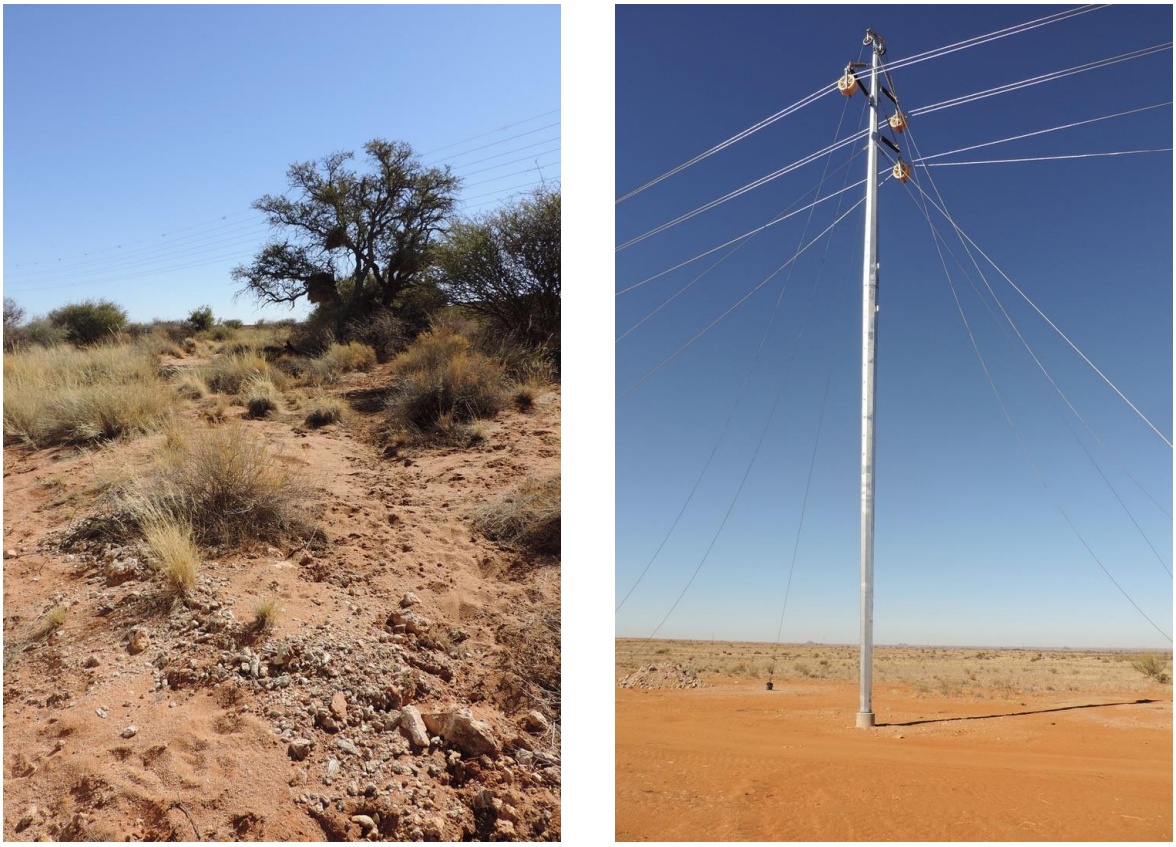

Figure 8 Photographic evidence preferential flow path areas where a deeper sand layer has accumulated over time (left) as well as the presence of newly erected electricity pylons in the area surrounding the proposed Naledi development area (right)

9.2 Land use and agricultural activities

Following the low and erratic rainfall patterns of the larger region within which the entire Naledi PV development area falls, the area has very limited to no suitability for rainfed crop production. The most suitable agricultural activities in the region is either livestock farming at low density or irrigated crop production using the water abstracted from the Orange River. No irrigation farming activities are present within the Naledi PV development area.

The two main access road alternatives considered also have no suitability for agricultural production. Alternative 1 (Main Access Road 1) largely consists of a surfaced road that underwent the required earthworks such as compaction, prior to surfacing and provides access to the existing Khi Solar One facility. Even in the case of future road decommissioning, the soil physical properties have already been compromised to the extent that any crop production in these areas will require a lengthy soil rehabilitation process. Alternative 2 (Main Access Road 2) consists of an existing unsurfaced road that is used by landowners in the area as well as construction workers that are involved in the construction of the nearby substation and other solar PV projects in the area.

Figure 9 Old water flow infrastructure at a preferential flow path crossing along an existing farm road

Figure 10 Photographic evidence of the sparse vegetation within the Naledi PV development area with the nearby Khi Solar One project visible on the horizon.

During the previous assessment of the area, old infrastructure such as water-crossings over preferential flow paths, were observed along existing old farm roads (Figure 9). The area is also characterised by sparse vegetation cover, therefore confirming the need for feed supplement to the livestock grazing these fields (Figure 10). During the previous site assessment of the area, the existing nearby renewable energy facilitiy (i.e. Khi Solar One) were also observed (Figure 10).

9.3 Sensitivity analysis

Following the guidelines stipulated in GN320 for the determination of allowable limits for the development of renewable energy projects with an output of more than 20MW , the following conclusions have been made:

- The Naledi PV development area as well as both the Main Access Road alternatives considered, are outside of any field crop boundaries (explained in detail in Section 8.2).
- The entire development area as well as both the Main Access Road alternatives can be categorised as having land capability classes ranging between Class 02 (Very low) to Class 05 (Low) (see Section 8.1 for detailed explanation).
- The entire Naledi PV development area as well as both the Main Access Road alternatives can be classified as having Low sensitivity (Figure 11).

Table 1 of GN 320 provides the allowable development limits for renewable energy generation developments with an output of 20MW or more, depending on the land capability classification and presence of field crop boundaries. According to this table, the allowable development limit for this area is 2.50ha per MW.

For the proposed Naledi PV project, this therefore limits the development footprint to 250ha. This is 80ha less than the area of 330ha currently applied for. The additional 80ha impacts on the available of grazing veld for 3 to 4 head of cattle or 10 to 11 head of sheep or goats. Following the results of this assessment, it is the report author's professional opinion that there will be no significant loss to agricultural food production in the region if the entire development area of 330ha required for 100MW output, is authorised by the Department of Environmental Affairs.

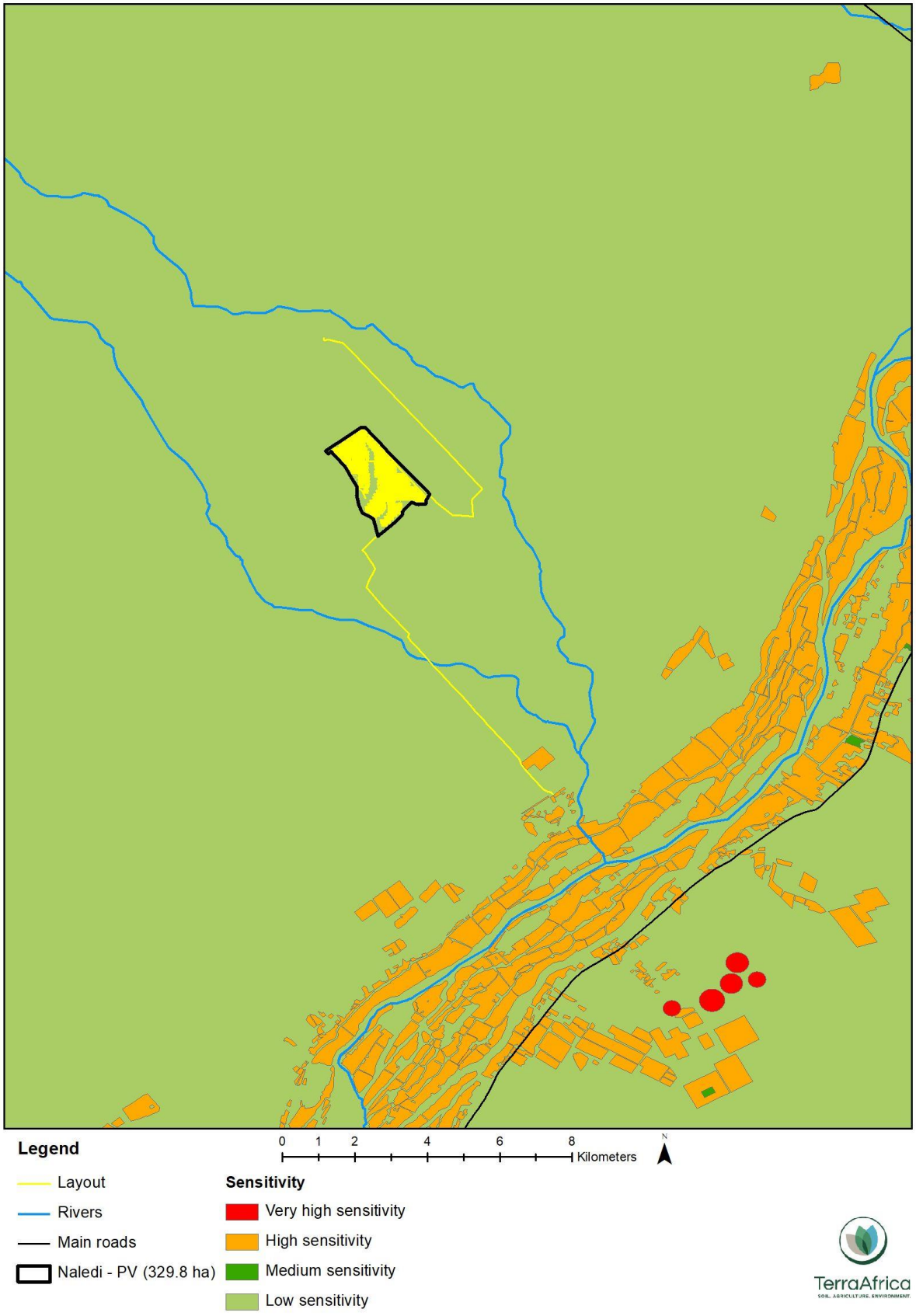

Figure 11 Classification of the agricultural sensitivity of the proposed Naledi PV project

10 Impact Assessment

10.1 Project description

Naledi PV is proposed to accommodate the following infrastructure which will enable the solar PV facility to supply a contracted capacity of up to 100MW:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m.
- Centralised inverter stations or string inverters.
- A laydown area.
- Cabling between the panels, to be laid underground where practical.
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid.
- A 6m wide access road to the development area.
- Internal access roads within the PV panel array and between project components with a maximum width of 5m.
- Operation and maintenance buildings, including a gate and security house, control centre, offices, warehouses, a workshop and visitors centre.

The power generated by Naledi PV will be sold to Eskom and will feed into the national electricity grid. Ultimately, Naledi PV is intended to be part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resources Plan (IRP) and will be under the Department of Mineral Resource and Energy ‘s Renewable Independent Power Producers Procurement Programme (REIPPPP).

A separate BA process has been undertaken for the grid connection infrastructure required to connect Naledi PV to the existing Upington Main Transmission Substation (MTS).

10.2 Description of the impacts anticipated for the project phases

The main envisaged activities during construction, which considers the list of infrastructure under section 10.1, include the following:

- site establishment which will require the limited clearance of vegetation and site levelling;
- construction of permanent access routes which entails the stripping of topsoil, dynamic compaction and the importation of gravel;
- construction of a photovoltaic power plant (mounting frame structure installation, installation of modules onto frames, digging of trenches to lay cables between modules);
- construction of campsite and laydown areas including:
    - workshops and maintenance area;
    - stores (for handling and storage of fuel, lubricants, solvents, paints and construction material);
    - contractor laydown areas (temporary);
    - mobile site offices;

- temporary waste collection and storage area; and
- parking area for cars and equipment.

The site preparation activities are disruptive to natural soil horizon distribution and will impact the current soil hydrological properties and functionality of soil.

The following anticipated impacts have been assessed.

* Soil erosion is anticipated due to slope and vegetation clearance. The impacts of soil erosion are both direct and indirect. The direct impacts are the reduction in soil quality which results from the loss of nutrient-rich upper layers of the soil and the reduced water-holding capacity of severely eroded soils. The off-site indirect impacts of soil erosion include the disruption of riparian ecosystems and sedimentation.

* Soil chemical pollution as a result of storage of hazardous chemicals, concrete mixing, temporary sanitary facilities and potential oil and fuel spillages from vehicles. This impact will be localised within the development area boundary.

* In areas of permanent changes such as roads and the erection of infrastructure, the current land capability and land use will be lost permanently. This impact will also be localised within the development area boundary, as well as the main access road providing access to the development area.

All infrastructure and activities required for the operation phase will be established during the construction phase. Once the construction phase is completed, a number of impacts will remain during the operation phase. These include impacts related to loss of land use and land capability. . Areas under permanent buildings, the on-site facility substation, transformers and PV panels are no longer susceptible to erosion, but hard surfaces will increase run-off during rainstorms onto bare soil surfaces.

Soil chemical pollution during the operation phase will be minimal. Possible sources are oil that need to be replaced and fuel spillage from maintenance vehicles. This impact will be localised within the development area boundary.

Although wind erosion may have an impact before revegetation on adjacent bare areas, the loss of soil as a resource is restricted to the actual footprint of Naledi PV. The only impact that may have effects beyond the footprint area is erosion which may cause the sedimentation of the adjacent watercourses.

10.3 Rating of the anticipated impacts

Susceptibility to soil erosion due to the construction and operation of Naledi PV facility

Table 1 Summary of soil erosion impact assessment

Nature: The construction of Naledi PV and the associated infrastructure will require the clearing and levelling of a limited area of land. The following construction activities will result in bare soil surfaces that will be at risk of erosion:

1. vegetation removal during site clearing;
2. creating impenetrable surfaces during the construction phase that will increase run-off onto bare soil surfaces; and
3. leaving soil surfaces uncovered during the rainy season during the construction phase.

During the operation phase the impenetrable surfaces such as paved areas and covered roads stay intact, however, the impact of increased run-off persists on surrounding areas.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
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;
- Soil stockpiles must be dampened with dust suppressant or a suitable equivalent;
- Soil stockpiles must be located away from any waterway or preferential water flow path in the landscape, to minimise soil erosion from these;
- Geo-textiles must be used to stabilise soil stockpiles and uncovered soil surfaces during the construction phase and to serve as a sediment trap to contain as much soil as possible that might erode away;
- The Stormwater Management Plan (SWMP) should provide for a drainage system sufficiently designed to prevent water run-off from the solar panels to cause soil erosion;
- Where discharge of rainwater on roads will be channelled directly into the natural environment, the application of diffuse flow measures must be included in the design; and
- Revegetate cleared areas as soon as possible after construction activities.

Residual Impacts:

The residual impact from the construction and operation of the Naledi PV project on the susceptibility to erosion will be negligible.

Chemical pollution due to the construction and operation of Naledi PV

Table 2 Summary of soil chemical pollution impact assessment

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 mechanical removal of vegetation during site clearing.
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 and operational workers.
5. Spills from fuel storage tanks during construction.
6. Polluted water from wash bays and workshops during the construction phase.
7. Accidental spills of other hazardous chemicals used and stored on site.
8. Pollution from concrete mixing.

The operation of the PV facility can result in the chemical pollution of the soil:

1. Spills from vehicles transporting workers and equipment to and from the site.
2. The generation of domestic waste by workers.

3. Accidental spills of other hazardous chemicals used and stored on site.

	Without mitigation	**With mitigation**
Extent	High (3)	Low (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	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:

- High level maintenance must be undertaken on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;
- Impermeable and bunded surfaces must be used for storage tanks and to park vehicles on;
- Site surface water and wash water must be contained and treated before reuse or discharge from site;
- Spills of fuel and lubricants from vehicles and equipment must be contained using a drip tray with plastic sheeting filled with adsorbent material;
- Spill kits should be available on site and should be serviced regularly;
- Waste disposal at the construction site and during operation must be avoided by separating, trucking out and recycling of waste;
- Potentially contaminating fluids and other wastes must be contained in containers stored on hard surface levels in bunded locations; and
- Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately by trained staff with the correct equipment and protocols as outlined in the EMPr.

Residual Impacts:

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

Loss of grazing land as a result of Naledi PV facility

Table 3 Summary of land capability impact assessment

Nature: The availability of grazing land available for livestock production, will be lost in the area where the Naledi PV project will be developed. The impact remains present through the operation phase. The following activities can result in the loss of land capability within the project development footprint:

1. Earthworks during the construction phase will remove the natural vegetation where the solar PV panels and other infrastructure are erected.
2. Access for livestock will be restricted once the boundary fence is erected around the project development area.

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

Mitigation:

- The layout of infrastructure should aim to be as dense as possible to avoid unnecessary large areas of impact.

Residual Impacts:
The residual impact from the construction and operation of the Naledi PV project will be of low significance.

11 Assessment of cumulative impacts

11.1 Assessment rationale

"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 development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

11.2 Other projects in the area

The broader study area around the development area of the Naledi PV project has been subject to application for other renewable projects (as listed in Table **4**) (depicted in Figure 12), all in different stages of the authorisation process. In addition, to the development areas where the projects will be constructed, there will be several linear developments to construct the grid connections required to feed the electricity generated into the existing electricity grid. Such a large number of projects are progressively changing the dominant current land use of the area from livestock farming to electricity generation. This is in line with the planning for this area, which falls within a Renewable Energy Development Zone (REDZ) and a Strategic Transmission Corridor (the northern corridor). In addition to this, the cumulative impact associated with the proposed development will be an increased risk for soil erosion when vegetation is removed and there is possible pollution of soil resources.

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

Table 4 Summary of other renewable projects in the larger area around Naledi PV that may result in cumulative impacts

Project Name	DEA Reference Number(s)	Location	Project Status
Khunab Solar Development: (4x 75MW PV) Klip Punt PV1 McTaggarts PV1 McTaggarts PV2 McTaggarts PV3	14/12/16/3/3/1/2110 14/12/16/3/3/1/2111 14/12/16/3/3/1/2112 14/12/16/3/3/1/2113	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452	Approved
Sirius Solar PV Project One (1 x 75MW PV)	14/12/16/3/3/2/469	Remaining Extent of the Farm Tungsten Lodge No. 638 – located in the south east of the development area.	Operational
Sirius Solar PV Project Two (1 x 75MW PV)	14/12/16/3/3/2/470	Remaining Extent of the Farm Tungsten Lodge No. 638 – located in the south-east of the development area.	Approved
Sirius Solar PV Project Three (1 x 100MW PV)	14/12/16/3/3/1/2704	Remaining Extent of the Farm Tungsten Lodge No. 638 – located in the south-east of the development area.	Approved
Sirius Solar PV Project Four (1 x 100MW PV)	14/12/16/3/3/1/2705	Remaining Extent of the Farm Tungsten Lodge No. 638 – located in the south-east of the development area.	Approved
Khi Solar One (1 x 50MW CSP)	12/12/20/1831	Portion 03 of the Farm McTaggarts Camp No. 435 – located immediately south east and within the development area.	Operational
Eskom Kiwno CSP (1 x 100MW CSP)	12/12/20/777	Farm Olyvenhouts Drift No. – located immediately to the east of the development area.	Approved
Dyasons Klip 1 and 2 (2 x 75MW)	14/12/16/3/3/2/538/1 14/12/16/3/3/2/538/2	Remainder of the Farm Dyasonklip No. 454 – immediately west of the development area.	Operational
Bloemsmond Solar 1 and 2 (2 x 75MW PV)	14/12/16/3/3/2/815 14/12/16/3/3/2/816	Portions 5 and 14 of the Farm Bloems Mond No. 455 – located to the south-west of the development area.	Approved

Bloemsmond 3,4 & 5 (3 x100 MW PV)	14/12/16/3/2/2/2042 14/12/16/3/2/2/2044 14/12/16/3/2/2/2043	Portions 5 and 14 of the Farm Bloemsmond No. 455 – located to the south-west	In process
Upington Solar Park (1 x 1 000MW CSP and PV)	12/12/20/2146	Farm Klip Kraal No. 451 – located to the east of the development area.	Approved
S-Kol PV Plant (1 x 100MW PV)	12/12/20/2230	Farm Geelkop No. 456 – located to the south-west of the development area.	Approved
Rooipunt (1 x 150MW CSP)	14/12/16/3/3/1/427	Farm McTaggarts Camp No. 435 – located directly to the north-west of the development area.	Approved
Solis Power I and II Projects (1 x 150MW CSP, 1 x 125MW CSP)	14/12/20/16/3/3/3/82 14/12/16/3/3/2/621	Portion 443 to 450 of the Farm Van Rooys Vlei – located to the north-west of the development area.	Approved
Upington Airport Solar PV (1 x 8.9MW PV)	12/12/20/2146	Erf 6013 Upington – located to the north-east of the development area.	Operational
Allepad PV (4 x 100MW)	14/12/16/3/3/2/1105 14/12/16/3/3/2/1106 14/12/16/3/3/2/1107 14/12/16/3/3/2/1108	Erf 5315 and Erf 01 Upington - located north-east of the development area.	Approved
Ephraim Sun Solar PV (1 x 75MW PV)	14/12/16/3/3/2/821	Remaining Extent of Portion 62 of the Farm Vaalkoppies No. 40 – located to the south-east of the development area.	Approved
Ofir-Zx PV Plant (1 x 200MW PV)	12/12/20/2229	Remaining extent of the Farm 616 - located to the south-west of the development area.	Approved
Eenduin Solar Park (1x 75MW PV)	14/12/16/3/3/2/631	Portion 2 of the Farm Eenduin No. 465 – located to the south-west of the development area.	Proposed
Bright Source CSP Facility (1 x 125MW CSP)	14/12/16/3/3/2/605	Remaining extent of the Farm No. 426 - located to the north-north-east of the development area.	Approved

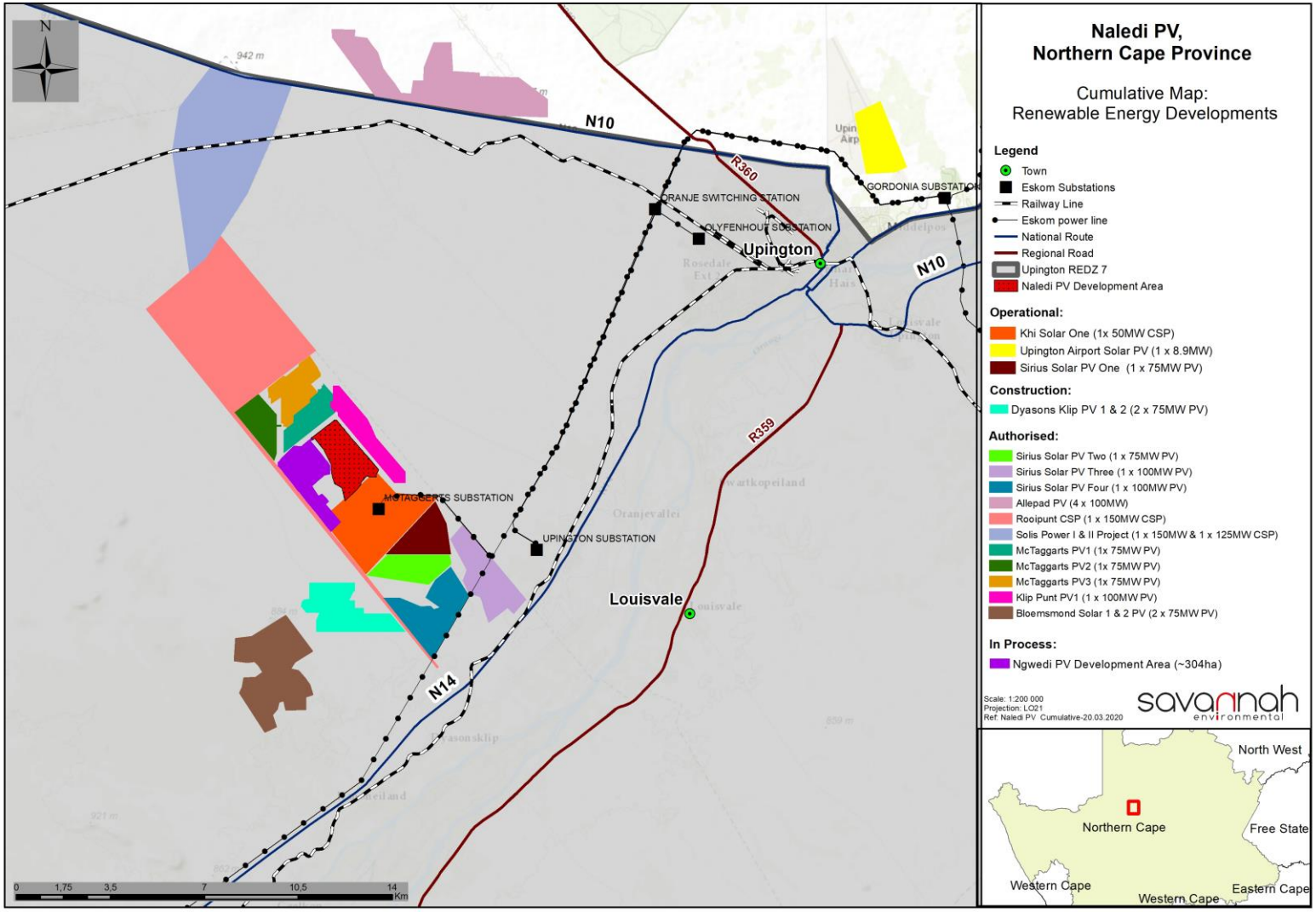

Figure 12 Locality of other renewable projects around the Naledi PV development area that may result in cumulative impacts (data source: Savannah Environmental (Pty) Ltd)

Table 5 Assessment of cumulative impact of decrease in areas available for livestock farming

Nature: Decrease in areas with suitable land capability for livestock 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	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Moderate (3)
Probability	Probable (4)	Probable (4)
Significance	**Medium (32)**	**Medium (40)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	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 solar energy facilities as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.		

Table 6 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)	Permanent (5)
Magnitude	Moderate (6)	Moderate (3)
Probability	Probable (3)	Probable (4)
Significance	**Medium (30)**	**Medium (40)**
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 Section 10.3 above.		

Table 7 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	Medium-term (3)	Permanent (5)
Magnitude	Moderate (6)	Moderate (3)
Probability	Probable (3)	Probable (4)
Significance	**Medium (30)**	**Medium (40)**
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 Section 10.4 above.		

12 Soil, land use and land capability management plan

The management plan for the management of the impacts described in Section 10.

Table 8 Measures to mitigate, manage and monitor soil for susceptibility to erosion

OBJECTIVE: To construct the facility in a manner that ensures the protection of soils against erosion caused by the removal of vegetation cover and compaction of soil, and to maintain and monitor the terrain of the Naledi PV development area.		
Project Component/s	Construction and Operation Phases	
Potential Impact	Susceptibility to erosion.	
Activity / Risk source	• Vegetation removal during site clearing; • Creating impenetrable surfaces; • Leaving soil surfaces uncovered by vegetation.	
Mitigation: **Target / Objective**	Revegetate, maintain and monitor the Naledi PV development area.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
• Soil stockpiles must be dampened with dust suppressant or suitable equivalent to prevent erosion by wind. • Land clearance must only be undertaken immediately prior to construction activities. • Unnecessary land clearance must be avoided. • All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised with erosion control mats (geo-textiles) and revegetated. • Ensure vegetation is re-established on disturbed surfaces as soon as construction has been completed in an area. • Implement storm water control measures stipulated in the stormwater management plan.	» EPC Contractor » EO	Ongoing during construction. Revegetate as soon as possible after construction is completed.
Performance indicator	Prevent, minimise and manage any visible erosion in the development area during construction and operation of the Naledi PV Facility.	
Monitoring	• On-going visual assessment of compliance with erosion prevention by EPC Contractor and EO. • Monitor visual signs of erosion such as the formation of gullies after rainstorms and the presence of dust emissions during wind storms.	

	• Any signs of soil erosion within the development area should be documented (including photographic evidence and coordinates of the problem areas) and submitted to the management team of Naledi PV (Pty) Ltd. • Monitor compliance of construction workers to restrict construction work to the clearly defined limits of the construction site in order to keep footprint as small as possible. • Where vegetation is not re-establishing itself in areas where surface disturbance occurred, soil samples must be collected, analysed for pH levels, electrical conductivity (EC) and major plant nutrient levels (calcium, magnesium, potassium) and sodium. • When vegetation re-establishment still remains unsatisfactory, the bulk density of the soil should be measured with a penetrometer to determine whether compaction is an issue. • The results must be submitted to a professional soil or agricultural scientist for recommendations on the amendment of the issue to ensure that the vegetation cover is established, and erosion prevented.

Table 9 Measures to mitigate, manage and monitor soil for susceptibility to soil pollution

OBJECTIVE: 1. To construct and operate the Naledi PV facility in a manner that minimise the pollution of soil by hydrocarbon spills from vehicles and machinery, and resultant waste material and pollution that may result from oil during the operation phase. **2.** To store and use fuel, lubricants, pesticides, herbicides and other hazardous chemicals safely, and to prevent spills and contamination of the soil resource.		
Project Component/s	Construction and Operation Phases	
Potential Impact	Soil pollution	
Activity / Risk source	• Hydrocarbon spills by vehicles and machinery during leveling, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks; • Accidental spills of hazardous chemicals; • Generation of domestic waste by construction workers; • Polluted water from wash bays and workshops • Pollution from concrete mixing and damaged PV panels.	
Mitigation: **Target / Objective**	• Prevent and contain hydrocarbon leaks. • Undertake proper waste management. • Store hazardous chemicals safely in a bunded area.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
• Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing areas. • Waste disposal at the construction site and during operation must be avoided by separating and trucking out of waste.	• EPC Contractor • EO	On-going visual assessment during the construction and operation phases to detect polluted areas and the application of clean-up and preventative procedures. .

• Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained people with the appropriate equipment.		
Performance indicator	• Check vehicles and machinery daily for oil, fuel and hydraulic fluid leaks; • Undertake high standard maintenance on vehicles; • Proper waste management; • Safe storage of hazardous chemicals.	
Monitoring	• On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures. • Monitor hydrocarbon spills from vehicles and machinery during construction continuously and record volume and nature of spill, location and clean-up actions. • Monitor maintenance of drains and intercept drains weekly. • Analyse soil samples for pollution in areas of known spills or where a breach of containment is evident when it occurs. • Records of accidental spills and clean-up procedures and the results thereof must be audited on an annual basis by the EO during construction and the environmental manager during operation. • Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to the Naledi PV management team annually. • Gaps must be identified and procedures must be amended if necessary by the project management team.	

Table 10 Measures to mitigate, manage and monitor loss of land capability

OBJECTIVE: To keep the solar PV facility footprint as small as possible and minimise the loss of land capability.		
Project Component/s	Construction and Operation Phases	
Potential Impact	Loss of Land Capability	
Activity / Risk source	• The removal of vegetation during site clearing; • Earthworks which destroy the natural layers of the soil profiles; and • The construction of access roads and the photovoltaic power plant (frame structures and installation of modules onto frames) and infrastructure which will cover soil surfaces.	
Mitigation: **Target / Objective**	Keep the project footprint as small as possible	
Mitigation: Action/control	**Responsibility**	**Timeframe**
• Keep the project footprint as small as possible	» EPC Contractor » EO	On-going visual assessment of compliance by EPC Contractor to stay within the design footprint.
Performance indicator	Stay within the boundary of the solar PV facility development area as designed and agreed upon.	
Monitoring	• Monitor compliance of construction workers to restrict construction work to the clearly defined limits of the construction site by EO. • Reporting by EO to the Naledi PV management team if any impacts outside the PV facility fence take place. • If any transgressions occur, corrective actions should be taken.	

13 Consideration of alternatives

Two main access road alternatives were provided by the applicant for consideration. Both the roads make use of existing roads. Main Access Road Alternative 1 is on an existing surfaced road while Main Access Road Alternative 2 is on an existing unsurfaced gravel road. Since both roads already exist, there will be no additional impact on either soil properties or the agricultural potential of either of the road alternatives.

Considering that increased traffic on the unsurfaced road (Main Access Road Alternative 2) will result in dust generation, Main Access Road Alternative 1 is the preferred alternative from a soils and agricultural potential perspective. Although the dust generation may be some distance from the viticulture blocks south-east of the development area, a continuous dust plume may cause dust to settle on the vine leaves and affect photosynthesis (and therefore production) of the plants.

14 Acceptability statement

The proposed Naledi PV project infrastructure is mainly located on shallow, rocky soils with very low to low land capability (Class 02 to Class 05). The grazing capacity of the entire area is very low (28 to 32 ha/LSU) and the vegetation observed during the previous assessment of the area, is sparse due to the low rainfall of the area. The development area and the main access road alternatives considered, fall outside any blocks of field crops. The receiving agricultural environment therefore has low sensitivity to the proposed project.

The proposed Naledi PV project will have medium to minor impacts on soil and land capability properties as well as the current land use in the area where the footprint will result in surface disturbance. Cumulative impacts are related to an increase in the loss of agricultural land used for livestock farming in addition to the other areas where solar PV projects will be constructed. These impacts can be reduced by keeping the footprints minimised where possible and strictly following soil management measures pertaining to erosion control and management and monitoring of any possible soil pollution sources such as vehicles traversing over the sites.

The proposed Naledi PV project falls within a larger area that is considered highly suitable for the development of renewable energy projects (i.e. Upington REDZ 7). While the proposed development area exceeds the allowable limit for the area with 54ha (according to GN320), it is still considered an acceptable project within the larger area as it has very limited impacts.

The Naledi PV project is considered a viable land use option for an area that has been characterised by low rainfall in an erratic pattern that significantly limits the food production potential of the area. It is my professional opinion that this application be considered favourably, permitting that the soil management measures are followed to prevent soil erosion. The project infrastructure should also remain within the development area boundaries indicated in the project layout.

15 Reference list

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

APPENDIX 1 - CURRICULUM VITAE OF SPECIALIST (Mariné Pienaar)

- **Personal Details**

  Last name: **Pienaar**
  First name: **Mariné**
  Nationality: **South African**
  Employment: **Self-employed (Consultant)**

- **Contact Details**

  Email address: mpienaar@terraafrica.co.za
  Website: **www.terraafrica.co.za**
  Mailing address: **PO Box 433, Ottosdal, 2610**
  Telephone: **+27828283587**
  Address: **57 Kruger Street, Wolmaransstad, 2630, Republic of South Africa**
  Current Job: **Lead Consultant and Owner of Terra Africa Consult**

- **Concise biography**

Mariné Pienaar is a professionally registered soil- and agricultural scientist (SACNASP) who has consulted extensively for the past eleven years in the fields of soil, land use and agriculture in several African countries. These countries include South Africa, Liberia, Ghana, DRC, Mozambique, Botswana, Angola, Swaziland and Malawi. She has worked with mining houses, environmental consulting companies, Eskom, government departments as well as legal and engineering firms. She conducted more than three hundred specialist studies that included baseline soil assessment and rehabilitation planning for new projects or expansion of existing projects, soil quality monitoring, land rehabilitation assessment and monitoring, natural resource assessment as part of agricultural project planning, evaluation and development of sustainable agriculture practices, land use assessment and livelihood restoration planning as part of resettlement projects and land contamination risk assessments. She holds a BSc. Agriculture degree with specialisation in Plant Production and Soil Science from the University of Pretoria and a MSc in Environmental Science from the University of the Witwatersrand. In addition to this, she has attended a number of courses in Europe, the USA and Israel in addition to those attended in South Africa. Mariné is a contributing author of a report on the balance of natural resources between the mining industry and agriculture in South Africa (published by the Bureau for Food and Agricultural Policy, 2015).

- **Qualifications**

  Academic Qualifications:

  - **MSc Environmental Science**; University of Witwatersrand, South Africa, 2017
  - **BSc (Agric) Plant Production and Soil Science;** University of Pretoria, South Africa, 2004
  - **Senior Certificate / Matric;** Wolmaransstad High School, South Africa, 2000

Courses Completed:

- **World Soils and their Assessment;** ISRIC – World Soil Information, Wageningen, 2015
- **Intensive Agriculture in Arid- and Semi-Arid Environments** – Gilat Research Centre, Israel, 2015
- **Hydrus Modelling of Soil-Water-Leachate Movement;** University of KwaZulu-Natal, South Africa, 2010
- **Global Sustainability Summer School 2012;** Institute for Advanced Sustainability Studies, Potsdam, Germany, 2012
- **Wetland Rehabilitation;** University of Pretoria, South Africa, 2008
- **Enviropreneurship Institute;** Property and Environment Research Centre [PERC], Montana, U.S.A., 2011
- **Youth Encounter on Sustainability;** ACTIS Education [official spin-off of ETH Zürich], Switzerland, 2011
- **Environmental Impact Assessment │Environmental Management Systems – ISO 14001:2004 │Environmental Law;** University of Potchefstroom, South Africa, 2008
- **Carbon Footprint Analyst Level 1;** Global Carbon Exchange Assessed, 2011
- **Negotiation of Financial Transactions;** United Nations Institute for Training and Research, 2011
- **Food Security: Can Trade and Investment Improve it?** United Nations Institute for Training and Research, 2011

- **Language ability**

Perfectly fluent in English and Afrikaans (native speaker of both) and conversant in French.

- **Professional Experience**

Name of firm	Terra Africa Environmental Consultants
Designation	Owner | Principal Consultant
Period of work	December 2008 to Date

- **Prior Tenures**

Integrated Development Expertise (Pty) Ltd; **Junior Land Use Consultant** [July 2006 to October 2008]
Omnia Fertilizer (Pty) Ltd; **Horticulturist and Extension Specialist** [January 2005 to June 2006]

- **Professional Affiliations**

- South African Council for Natural Scientific Professions [SACNASP]
- Soil Science Society of South Africa [SSSA]
- Soil Science Society of America
- South African Soil Surveyors' Organisation [SASSO]
- International Society for Sustainability Professionals [ISSP]

Summary of a selected number of projects completed successfully:

[Comprehensive project dossier available on request]

1. *Sekoko Railway Alignment and Siding Soil, Land Use and Capability Study* in close proximity to the Medupi Power Station in the Lephalale area, Limpopo Province.

2. *Italthai Rail and Port Projects, Mozambique* – The study included a thorough assessment of the current land use practices in the proposed development areas including subsistence crop production and fishing as well as livestock farming and forestry activities. All the land uses were mapped and intrinsically linked to the different soil types and associated land capabilities. This study was used to develop Livelihood Restoration Planning from.

3. *Bomi Hills Railway Alignment Project, Liberia:* soil, land use and agricultural scientist for field survey and reporting of soil potential, current land use activities and existing soil pollution levels, as well as associated infrastructure upgrades of the port, road and railway.

4. *Kingston Vale Waste Facility, Mpumalanga Province, South Africa*: Soil and vegetation monitoring to determine the risk of manganese pollution resulting from activities at the waste facility.

5. *Keaton Mining's Vanggatfontein Colliery, Mpumalanga*: Assessment of soil contamination levels in the mining area, stockpiles as well as surrounding areas as part of a long-term monitoring strategy and rehabilitation plan.

6. *Richards Bay Minerals, KwaZulu-Natal*: Contaminated land assessment of community vegetable gardens outside Richards Bay as a result of spillages from pipelines of Rio Tinto's Richards Bay Minerals Mine.

7. *Buffelsfontein Gold Mine, Northwest Province, South Africa:* Soil and land contamination risk assessment for as part of a mine closure application. Propose soil restoration strategies.

8. Glenover Phosphate Mining Project near Steenbokpan in the Lephalale area – Soil, Land Use and Land Capability Study as part of the environmental authorisation process.

9. *Waterberg Coal 3 and 4 Soil, Land Use and Land Capability Study* on 23 000 ha of land around Steenbokpan in the Lephalale area.

10. *Lesotho Highlands Development Agency, development of Phase II (Polihali Dam and associated infrastructure)*: External review and editing of the initial Soil, Land Use and Land Capability Assessment as requested by ERM Southern Africa.

11. *Tina Falls Hydropower Project, Eastern Cape , South Africa*: Soil, land use and land capability assessment as part of the ESIA for the construction of a hydropower plant at the Tina Falls.
12. *Graveyard relocation as part of Exxaro Coal's Belfast Resettlement Action Plan*: Soil assessment to determine pedohydrological properties of the relocation area in order to minimise soil pollution caused by graveyards.

13. *Rhino Oil Resources: Strategic high-level soil, land use and land capability assessment of five proposed regions to be explored for shale gas resources in the KwaZulu-Natal, Eastern Cape, North-West and Free State provinces of South Africa.*

14. *Eskom Kimberley Strengthening Phase 4 Projec*t, Northern Cape & Free State, South Africa: soil, agricultural potential and land capability assessment.

15. *Mocuba Solar Project, Mozambique* – The study included a land use assessment together with that of the soil and land capabilities of the study area. All current land uses were documented and mapped and the land productivity was determined. This study advocated the resettlement and livelihood restoration planning.

16. *Botswana (Limpopo-Lipadi Game Reserve).* Soil research study on 36 000 ha on the banks of the Limpopo River. This soil study forms part of an environmental management plan for the Limpopo-Lipadi Game Reserve situated here as well as the basis for the Environmental Impact Assessment for the development of lodges and Land Use Management in this area.

17. *TFM Mining Operations [proposed] Integrated Development Zone, Katanga, DRC* [part of mining concession between Tenke and Fungurume]: soil and agricultural impact assessment study.

18. *Closure Strategy Development for Techmina Mining Company – Lucapa, Angola.* Conducted an analysis of the natural resources (soil, water) to determine the existing environmental conditions on an opencast diamond mine in Angola. The mine currently experience severe problems with kimberlite sediment flowing into the river. A plan is currently being developed to change the mining area into a sustainable bamboo farming operation.

19. *Closure of sand mining operations, Zeerust District.* Succesfully conducted the closure application of the Roos Family Sand Mine in the Zeerust District. Land Use Management Plans for rehabilitated soil were developed. The mine has closed now and the financial provision has been paid out to the applicant.

20. *ESIA for [proposed] Musonoi Mine, Kolwezi area, Katanga, DRC:* soil, land use and land capability assessment.

21. *Bauba A Hlabirwa Moeijelik Platinum mine [proposed] project, Mpumalanga, South Africa:* soil, land use and land capability assessment and impact on agricultural potential of soil.

22. *Commissiekraal Coal Mine [proposed] project, KwaZulu*-Natal, South Africa: sustainable soil management plans, assessment of natural resource and agricultural potential and study of the possible impacts of the proposed project on current land use. Soil conservation strategies included in soil management plan.

23. *Cronimet Chrome Mine [proposed] project, Limpopo Province, South Africa:* soil, land use and land capability of project area and assessment of the impacts of the proposed project.
24. *Moonlight Iron Ore Land Use Assessment, South Africa* – Conducted a comprehensive land use assessment that included interviews with land users in the direct and indirect project zones of influence. The study considered all other anticipated social and environmental impacts such as water, air quality and noise and this was incorporated into a sensitivity analysis of all land users to the proposed project.

25. *Project Fairway Land Use Assessment, South Africa* – The study included an analysis of all land users that will directly and indirectly be influenced by the project. It analysed the components of their land uses and how this components will be affected by the proposed project. Part of the study was to develop mitigation measures to reduce the impact on the land users.

26. *Bekkersdal Urban Renewal Project – Farmer Support Programme,* Independent consultation on the farmer support programme that forms part of Bekkersdal Renewal Project. This entailed the production of short and long term business plans based on soil and water research conducted. Part of responsibilities were the evaluation of current irrigation systems and calculation of potential water needs, etc. as well as determining quantities and prices of all project items to facilitate the formalisation of tender documents.

27. *Area-based agricultural business plans for municipalities in Dr. Kenneth Kaunda Municipal District.* Evaluation of the agricultural and environmental status of the total district as well as for each municipality within the district. This included the critical evaluation of current agricultural projects in the area. The writing of sustainable, executable agricultural business plans for different agricultural enterprises to form part of the land reform plans of each Municipality within the district.

28. *Batsamaya Mmogo, Hartswater.* Conducted a soil and water assessment for the farm and compiled management and farming plans for boergoats grazing on *Sericea lespedeza* with pecan nuts and lucerne under irrigation.

29. *Anglo Platinum Twickenham Mine – Irrigated Cotton Project.* Project management of an irrigated cotton production project for Twickenham Platinum Mine. This project will ensure that the community benefit from the excess water that is available from the mine activities.

30. *Grasvally Chrome (Pty) Ltd Sylvania Platinum [proposed] Project, Limpopo Province, South Africa:* Soil, land use and agricultural potential assessment.

31. *Jeanette Gold mine project [reviving of historical mine], Free State, South Africa:* Soil, land use and agricultural potential assessment.

32. *Kangra Coal Project, Mpumalanga, South Africa:* Soil conservation strategies proposed to mitigate the impact of the project on the soil and agricultural potential.

33. *Richards Bay Integrated Development Zone Project, South Africa* [future development includes an additional 1500 ha of land into industrial areas on the fringes of Richards Bay]: natural resource and agricultural potential assessment, including soil, water and vegetation.

34. *Exxaro Belfast Coal Mine [proposed] infrastructure development projects* [linear: road and railway upgrade | site-specific coal loading facilities]: soil, land capability and agricultural potential assessment.

35. *Marikana In-Pit Rehabilitation Project of Aquarius Platinum, South Africa:* soil, land capability and land use assessment.
36. *Eskom Bighorn Substation proposed upgrades, South Africa:* soil, land capability and agricultural potential assessment.

37. *Exxaro Leeuwpan Coal Mining Right Area, South Africa:* consolidation of all existing soil and agricultural potential data. Conducted new surveys and identified and updated gaps in historic data sets.

38. *Banro Namoya Mining Operation, DRC:* soil, land use and agricultural scientist for field survey and reporting of soil potential, current land use activities and existing soil pollution levels, including proposed project extension areas and progressive soil and land use rehabilitation plan.

39. *Kumba Iron Ore's Sishen Mine, Northern Cape, South Africa: soil, land use and agricultural scientist* | *Western Waste Rock Dumps [proposed] Project:* soil, land use and agricultural potential assessment, including recommendations regarding stripping/stockpiling and alternative uses for the large calcrete resources available.

40. *Vetlaagte Solar Development Project, De Aar, South Africa:* soil, land use and agricultural scientist. Soil, land use and agricultural potential assessment for proposed new 1500 ha solar development project, including soil management plan.