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Agricultural Site Verification Assessment for Part 1 Amendment for Vaal River Solar PV Facilities near Orkney in the North West Province

Submitted by TerraAfrica Consult cc

Mariné Pienaar

15 June 2022

Table of Contents

List of Figures

List of Tables

1. Introduction

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd (Savannah) to conduct a site verification assessment of the properties that was previously authorised for the Vaal River Solar 2 PV Facility.The project area is located approximately 6km southeast of the City of Matlosana (Klerksdorp) in the North West Province (refer to **Figure 1**). The project area includes three project sites for PV development and are referred to as VRS 1, VRS 2 and VRS 3, respectively. The fourth project within the project area is the VRS 4 grid connection solution that will connect the PV areas to the Hermes Substation. The position of the four VRS projects is shown in Figure **2**.

The original Environmental Authorisation (EA) process included a Soil, Land Use, Land Capability and Agricultural Potential Survey that was compiled by JH van der Waals of Terra Soil Science and submitted 22 March 2012. The EA was granted but the projects have not progressed to the construction phase since the authorisation.

The Applicant has now requested amendments to both the PV project as well as the grid connection. The following amendments are requested for the PV project:

- To amend the authorised solar PV capacity with no adjustment to the PV panel height and development footprint of the facility from that as authorised.
- Inclusion of BESS into the project description.
- An extension of the validity of the Environmental Authorisation.

For the grid connection, the Applicant is requesting the following amendment:

- An extension of the validity of the Environmental Authorisation.

The Agricultural Site Verification Report is applicable for all four VRS projects.

2. Details of the specialist

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. 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 consulted in the subject fields of soil, agriculture, pollution assessment and land use planning for the environmental sector of several African countries including Botswana, Mozambique, Democratic Republic of Congo, Liberia, Ghana and Angola. She has also consulted on the soil and agricultural assessment of a gas infrastructure project in Afghanistan. Mariné's project experience conducting assessments for renewable energy projects include solar and wind energy facilities in the Western, Northern and Eastern Cape as well as the North West, Free State and KwaZulu Natal Provinces. Her contact details are provided in Appendices 1 and 2 attached.

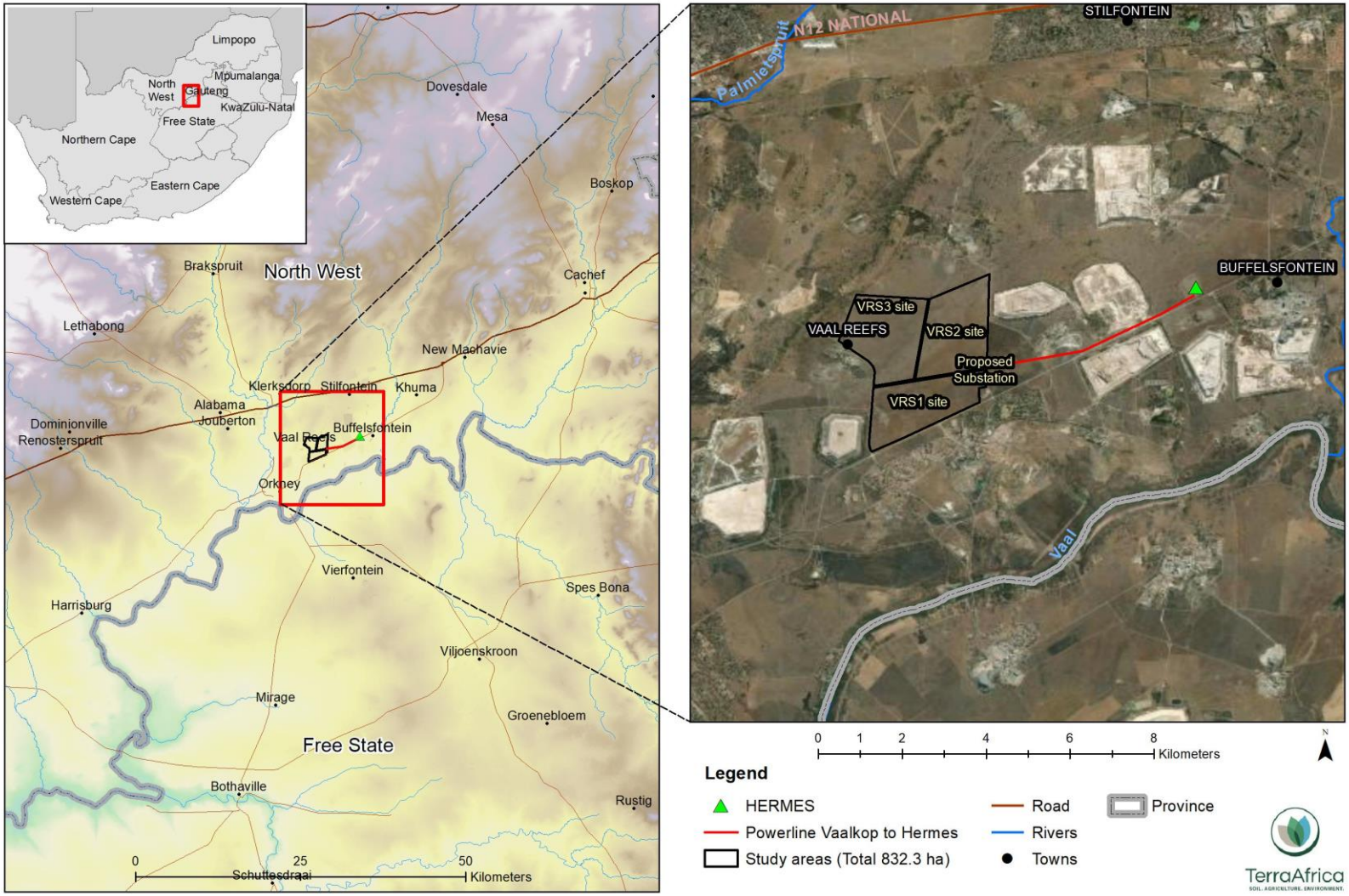


Figure 1: Locality of the VRS PV sites and grid connection (previously known as the Kabi Vaalkop PV Solar Energy Facility)

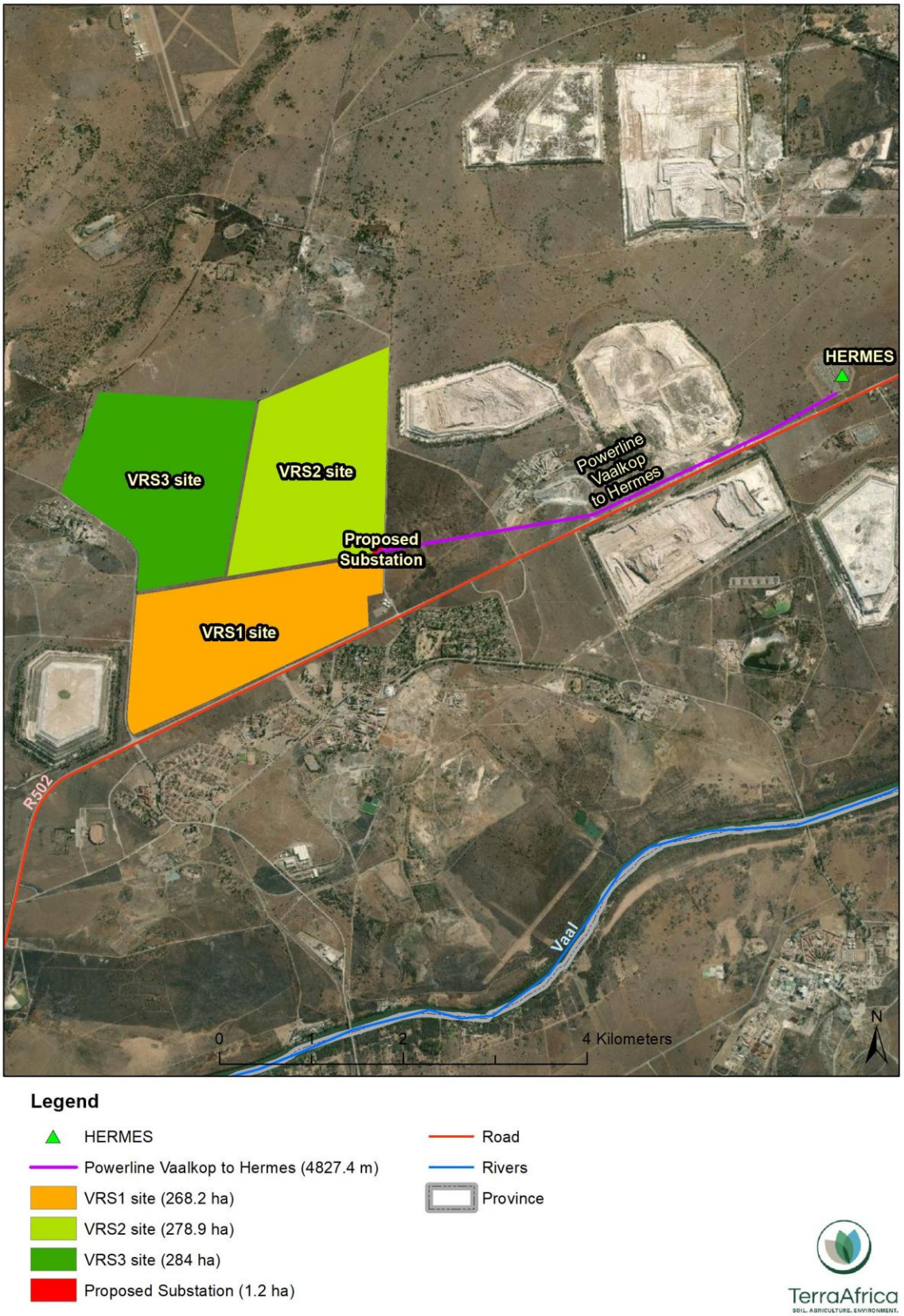


Figure 2: Layout of the four VRS projects within the area previously authorised as the Kabi Vaalkop PV Solar Energy Facility

3. Purpose and objectives of the validity assessment

The extension of the validity of the EA of both the PV projects and the grid connection, will take the validity of the current EA, beyond 10 years. In order for the Competent Authority to decide whether the validity of the EA can be extended without another EA process, information regarding the current baseline conditions and impacts associated with the project, are required. The purpose of the agricultural site verification assessment is to inform the authorities of any changes in the agricultural resources of the site since the EA was granted and whether the project will result in impacts additional to those identified during the initial assessment.

The objective of the agricultural site verification assessment therefore is:

- Provide a description of the agricultural resources (baseline) that was assessed during the initial assessment;
- Assess the current status of the agricultural resources;
- Provide a statement on whether the impact rating as provided in the initial assessment remains valid and if the mitigation measures provided in the initial assessment are still applicable;
- Determine if there are any new mitigation measures which need to be included into the EA, should the request to extend the commencement period be granted by the Department;
- Indicate if there are any new assessments/guidelines which are now relevant to the authorised development which were not undertaken as part of the initial assessment;
- Describe and assess any changes to the agricultural resources that has occurred since the initial EA was issued;
- Provide a description and an assessment of the surrounding environment, in relation to new developments or changes in land use which might impact on the authorised project (cumulative impact assessment).

4. Methodology

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

4.1 Review of initial assessment

Prior to the site visit, the Soil, Land Use, Land Capability and Agricultural Potential Survey that was compiled by JH van der Waals of Terra Soil Science and submitted 22 March 2012, was reviewed. This survey report was part of the initial EA process and contains information on the soil and agricultural resources of the entire project area.

4.2 Assessment of available desktop data

To consider data from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) that became available after 2012, the project area boundaries was also superimposed on three different raster data sets obtained from DALRRD. The data sets are:

- The Refined Land Capability Evaluation Raster Data for South Africa that was developed using a spatial evaluation modelling approach (DALRRD, 2016).
- 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).

4.3 Site assessment

To determine whether any changes to the baseline agricultural resources occurred since the initial assessment was compiled, the VSR sites were visited on 7 and 8 June 2022. The site was traversed by vehicle and on foot and the current land uses and surrounding land uses were documented. Soil was classified at ten observation points in order to verify the data of the initial assessment. The soil profiles 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. Photographic evidence of soil properties and current land uses were taken with a digital camera.

4.4 Impact assessment methodology for cumulative impacts

Following the methodology prescribed by Savannah, the cumulative impacts in relation to other renewable energy projects in the area, 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:

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

where:

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).

5. Baseline description

5.1 Initial assessment

According to the initial assessment by Van der Waals (2012), the northern section of the project area is dominated by deep Hutton soil profiles with dolomite outcrops visible on the soil surface.

The southern part of the project area is dominated by shallow, rocky soil profiles of the Mispah and Glenrosa forms.

The agricultural potential of the site is low for crop production as the shallow, rocky soil profiles are considered unsuitable for dryland crop production. The assessment states that the area is suitable for extensive grazing and has relatively high grazing capacity. However, it was also stated that the area is fragmented by roads and several landowners which makes livestock grazing more challenging. The presence of dolomite in the area that poses a risk for sinkholes, was provided as the reason why irrigated agriculture in the area is not a suitable land use option.

5.2 Results of site verification assessment

The results of the site assessment agree with the findings of the initial assessment regarding the dominant soil forms. Since the South North west Soil classification system was updated since the 2012 assessment, the new system published by the Soil Classification Working Group in 2018, is used to describe the soil forms on site.

5.2.1 Soil properties

a) Mispah/Glenrosa soils

The shallow Mispah and Glenrosa soils are still the dominant soil form of the southern part of the project area. The Glenrosa soils range in depth between 0.05 and 0.30m and consist of orthic topsoil horizons that are either bleached or chromic (dark red in colour) with lithic material underneath. The lithic horizon of the Glenrosa soils within the project 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).

The Mispah soils have similar shallow soil depth as the Glenrosa soils (0.05 to 0.30m) but differ in regard to the nature of the underlying material. The effective soil depth of the Mispah soils is restricted by solid and fractured rock. In some areas, the solid rock is visible on the surface as rock outcrops.

b) Nkonkoni/Vaalbos soils

The area of Hutton soils previously identified in the initial assessment, was renamed to either the Nkonkoni or Vaalbos soil form. The soil properties are still exactly the same, but the soil depths determined during the site visit, indicated that these soils are 1.5m deep or shallower and therefore now classifies as either the Nkonkoni or the Vaalbos form, depending on the nature of the underlying material. The Nkonkoni 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 lithic material. For the Vaalbos soil form, the effective soil depth is limited by solid and fracture rock.

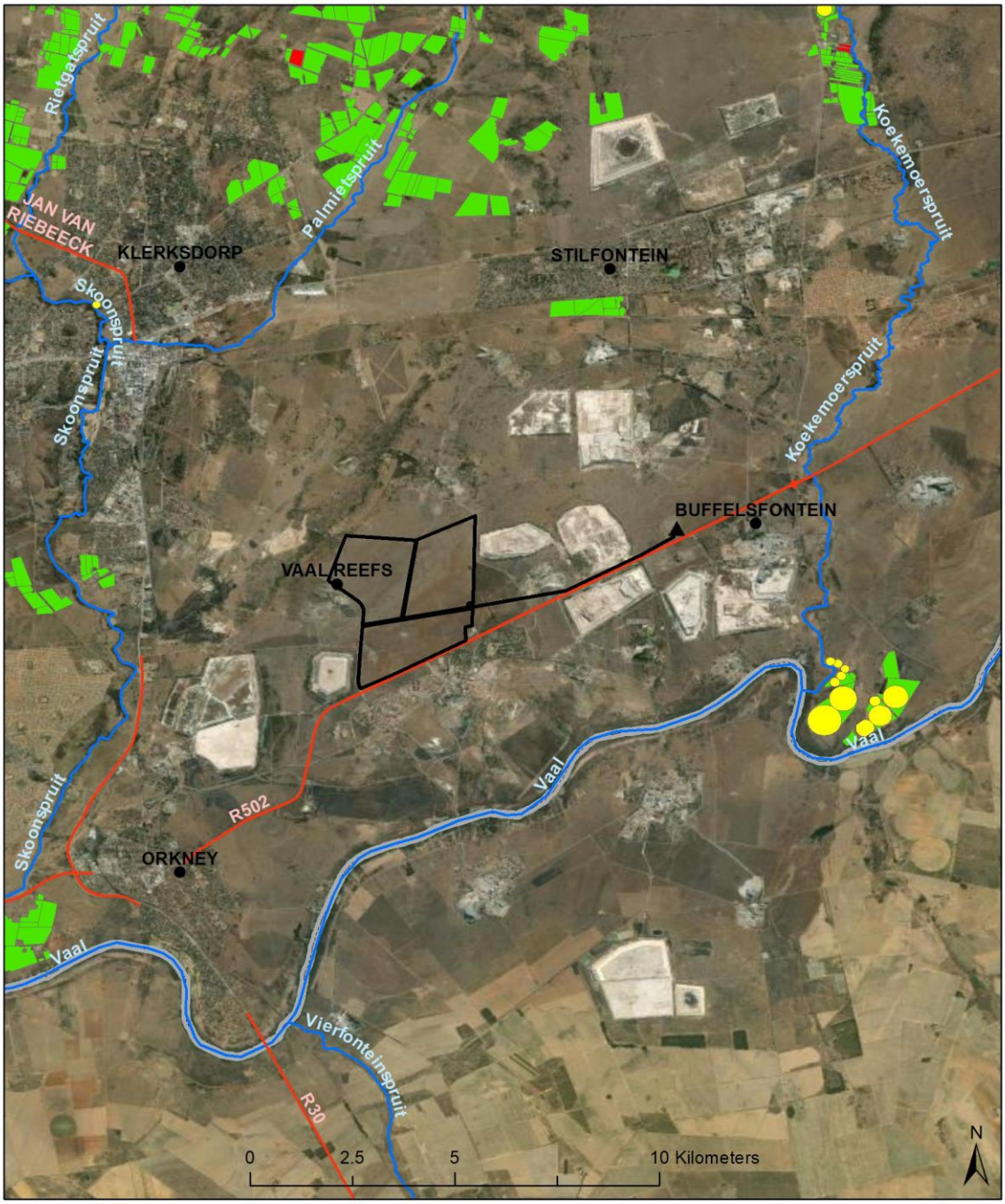
Figure 3: Nkonkoni soils with 0.4m effective soil depth within the project area

5.2.2 Agricultural potential

The largest part of the project area has Low agricultural potential. Low agricultural potential has been assigned to the Mispah/Glenrosa soil group because of the shallow soil depth that limits root growth and water storage capacity within these profiles. Some areas where these soils occur also have chunks of rocks on the surface.

The areas with the deeper Nkonkoni profiles, have Low-Moderate to Moderate-High agricultural potential, depending on the soil depth. Although the profiles are deeper than the Mispah/Glenrosa soil group, the effective soil depth of some areas still poses limitations to the water-storage capacity of the soil profiles and can limit crop root growth. In addition to the limitations posed by the soil depth, the presence of rock outcrops on the surface reduces the viability of the area for commercial crop production. Therefore, the entire project area is considered better suited to extensive livestock production. In the absence of any irrigation infrastructure, it is also not possible to produce irrigated crops in this area.

The low agricultural potential of the soils within the project area is confirmed by the absence of crop field boundaries following the delineation of DALRRD (2019) (see Figure 4). The nearest crop fields are 5km west of the project area and consist of rainfed annual crops around the Skoonspruit. The nearest irrigated agriculture is located approximately 9km southeast of the project area and consist of centre pivot irrigation adjacent to the Vaal River.



Legend

Field crops

- Old Fields
- Pivot Irrigation
- Rainfed Annual Crop Cultivation / Planted Pastures
- VRS Layout
- Road
- Rivers
- Towns
- Province

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Figure 4: Location of field crop boundaries around the VRS projects' area (data source: DALRRD, 2019)

5.2.3 Land capability

The land capability of the area according to the system developed by DALRRD (2016) was determined by superimposing the development areas within the project area, on the raster data. The results are depicted in Figure 5.

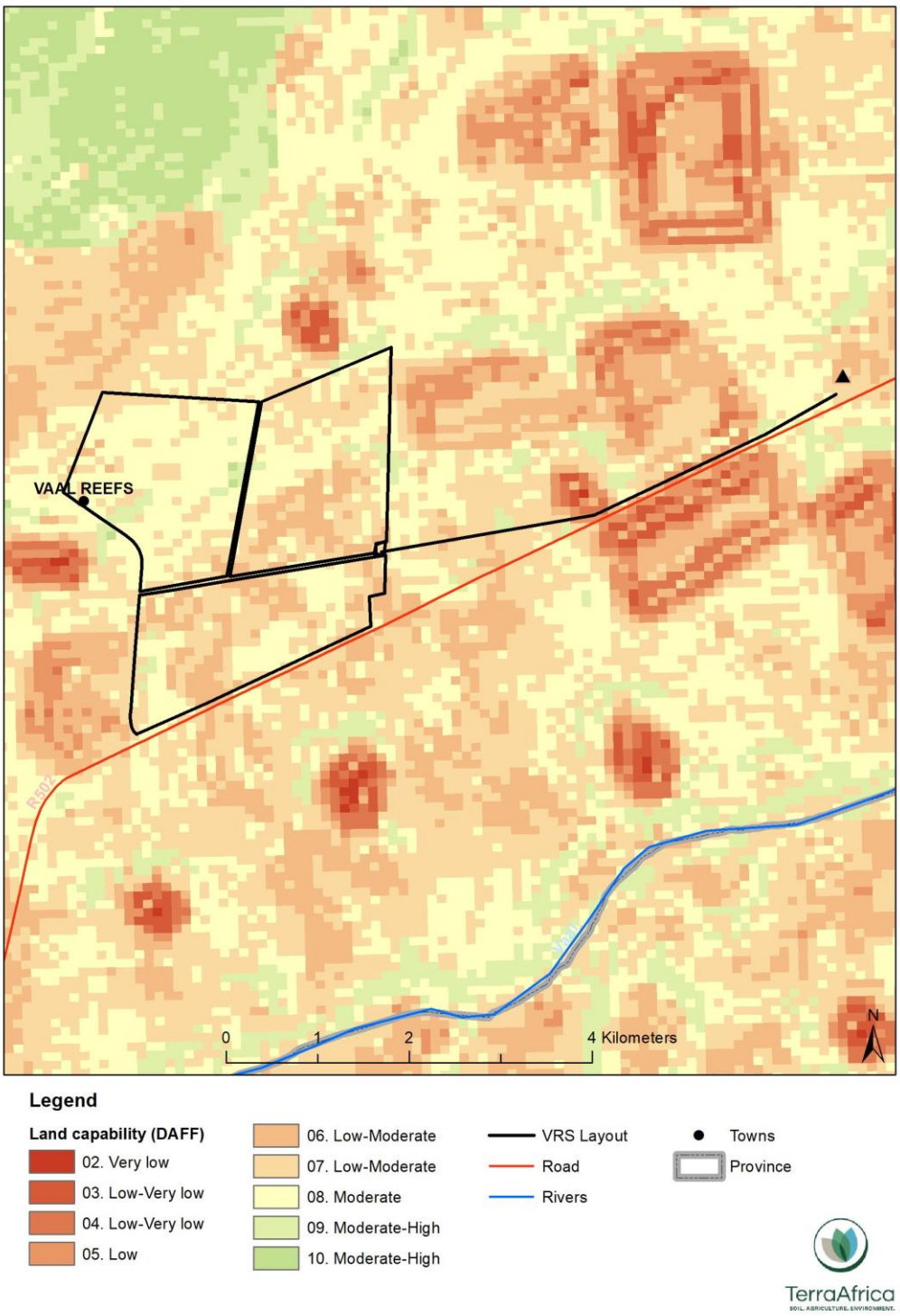

Figure 5: Land capability classification of the VRS projects' area (data source: DALRRD, 2016)

The dominant land capability classes within the project area, are Low-Moderate (Classes 06 and 07) and Moderate (Class 08). The highest land capability class within this area is Moderate-High (Class 09) which is in four very small, scattered areas throughout the project area. The higher land capability largely indicates areas where deeper Nkonkoni and Vaalbos forms may be present.

5.3 Sensitivity analysis

The site verification assessment confirmed that the project area mostly has Low agricultural sensitivity to the proposed development. The soil forms present within the project area, are mainly shallow soils that range in depth between 0.05 and 0.30m. Rock outcrops are present on the surface in several areas, even between areas with deeper soils of the Vaalbos and Nkonkoni forms. While there are areas with deeper soils, the small size of these areas reduces their viability for commercial rainfed crop production and the area is considered more suitable for livestock farming. 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 project area was also superimposed on the newly developed High Potential Agricultural Areas of North West Province (DALRDD, 2020) to determine whether the area falls within any of these areas. The result of the analysis is shown in Figure **6**. The project area does not overlap with any High Potential Agricultural Areas and the nearest area is located 10km north of the project area.

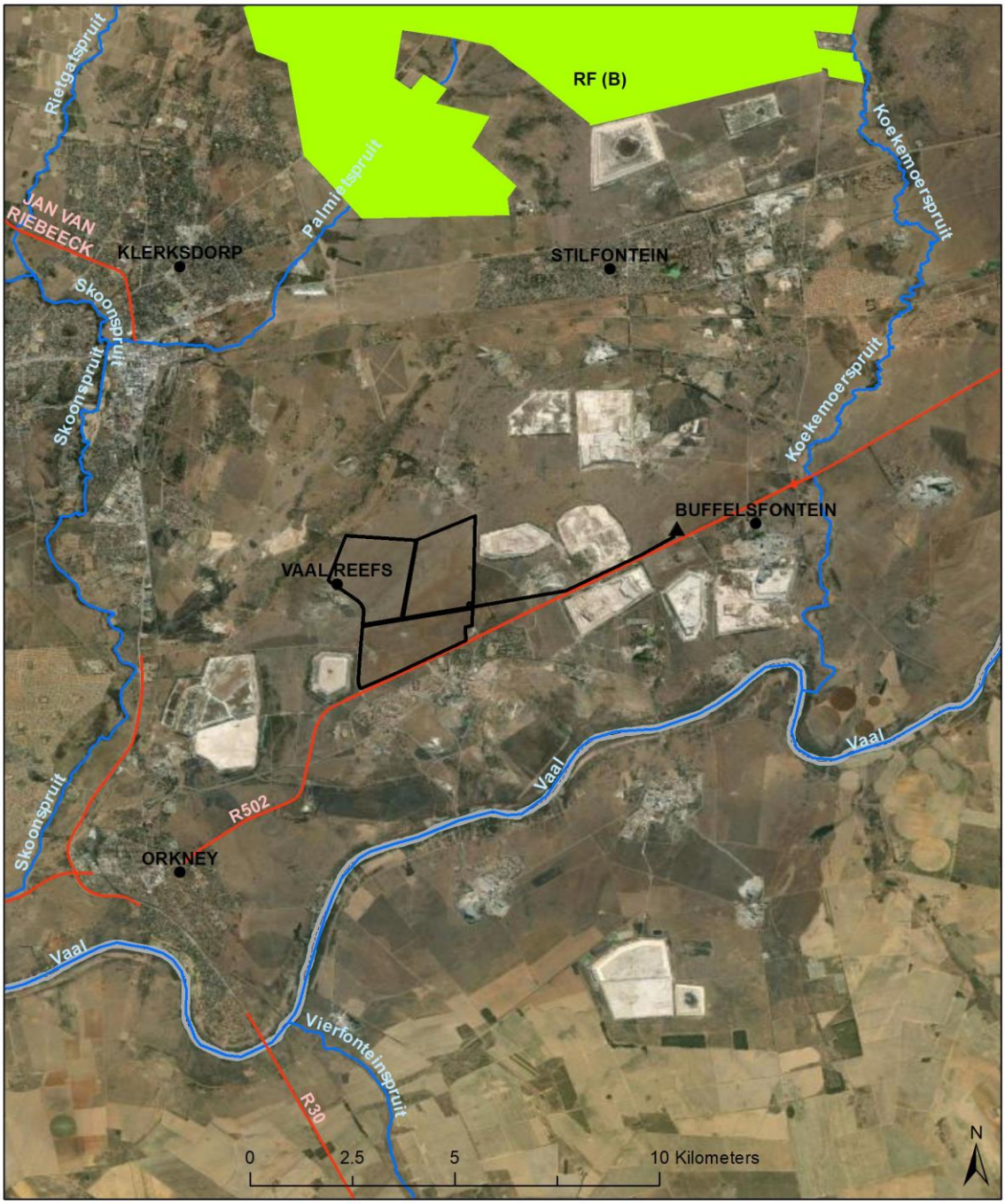

Figure 6: The project area in relation to High Potential Agricultural Areas of the North West Province (data source: DALRRD, 2020)

6. Impact assessment

6.1 Direct and indirect impacts

Following the amendment requests of the applicant, all impacts identified within the original report compiled by TerraSoil in 2012, is still applicable for the amendments requested. No additional impacts or change in impact significance will occur as a result of this amendment. No additional mitigation measures are required because of the proposed amendments.

6.2 Cumulative impacts

"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.

The VRS projects will be located within a 30km radius of Buffels Solar pV 1 Solar Energy Facility and Orkney PV SEF and 92M 132KV powerline that already have been granted Environmental Authorisation (see Figure 7). The cumulative impacts of the proposed project in addition to the authorised solar developments are rated and discussed below.

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

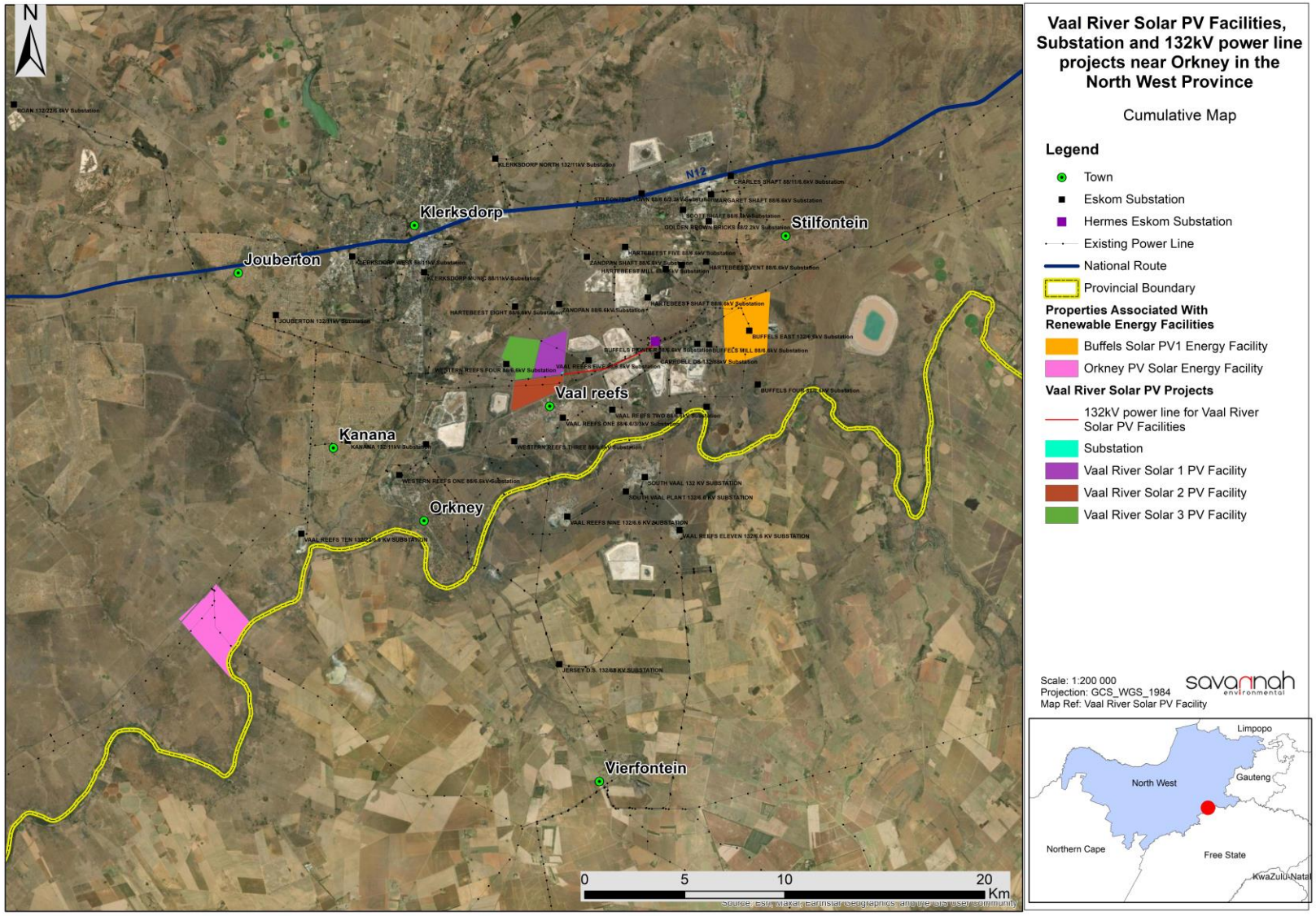

Figure 7 Renewable energy projects within a 30km radius around the VRS project area

Table 1 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	Very short duration - 0-1 years (1)	Short duration – 2 – 5 years (2)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (12)**	**Low (24)**
Status (positive/negative)	Negative	Negative
Reversibility	High	Low
Loss of resources?	No	Yes
Can impacts be mitigated?	N/A	No
Confidence in findings: High.		
Mitigation: The only mitigation measure for this impact is to keep the footprints of all grid infrastructure as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.		

Table 2 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. above.		

Table 3 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 Section 10.2 above.		

Table 4 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 above.		

7. Acceptability statement

Following the data analysis and cumulative impact assessment above, the previously authorised VRS projects are still considered an acceptable development in the project area, even with the requested amendments now made by the applicant.

The soil forms present within the development area consist mostly of shallow soils underlain by lithic material and rock that has severe limitations to rainfed crop production. These soils are of the Mispah and Glenrosa forms and the effective depths of these soils are between 0.05 and 0.30m. Although there are areas with deeper soils of the Nkonkoni and Vaalbos forms (previously collectively classified as Hutton soils), the areas are scattered within the project area and not considered a viable size for rainfed crop production. The entire project has never been used for rainfed or irrigated crop production before. There is also no irrigation infrastructure, such as centre pivots or drip irrigation, present within the project area and the area is considered more suitable for livestock farming.

It is my professional opinion that amendment requests be considered favorably, permitting that the mitigation measures of the initial assessment still be implemented. No additional mitigation measures are recommended.

8. 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, 2016. *National land capability evaluation raster data: Land capability data layer*, 2016. Pretoria.

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

APPENDIX 1 - CURRICULUM VITAE OF SPECIALIST

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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

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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

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